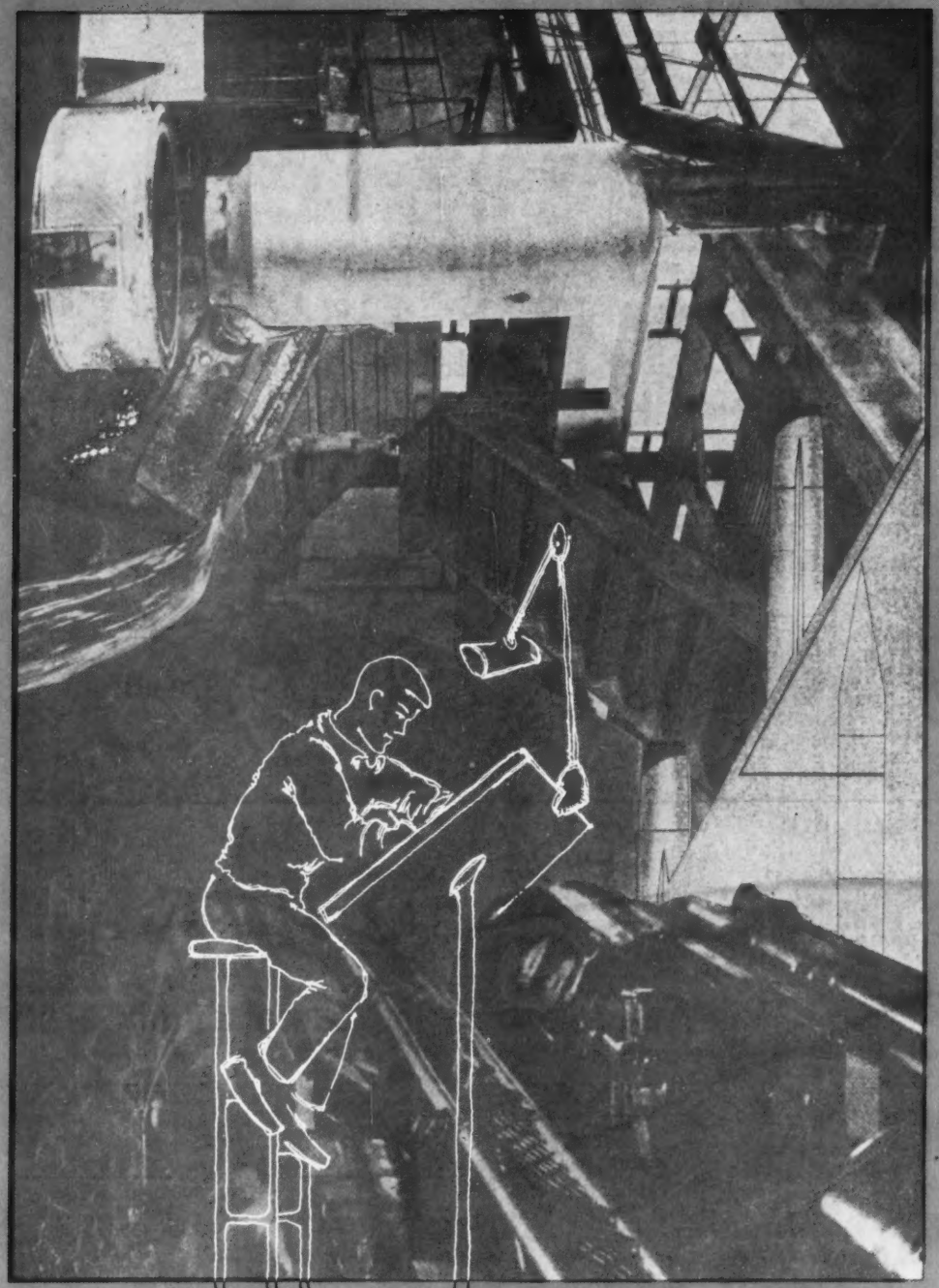

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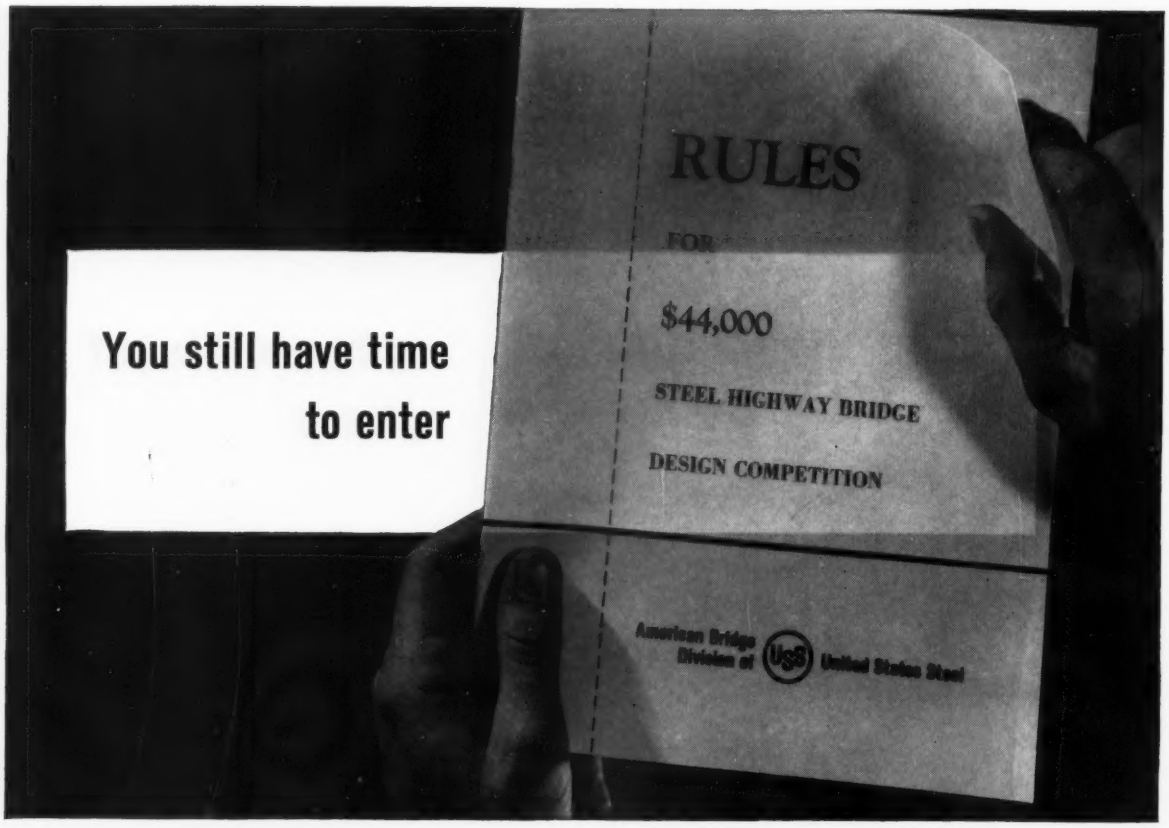

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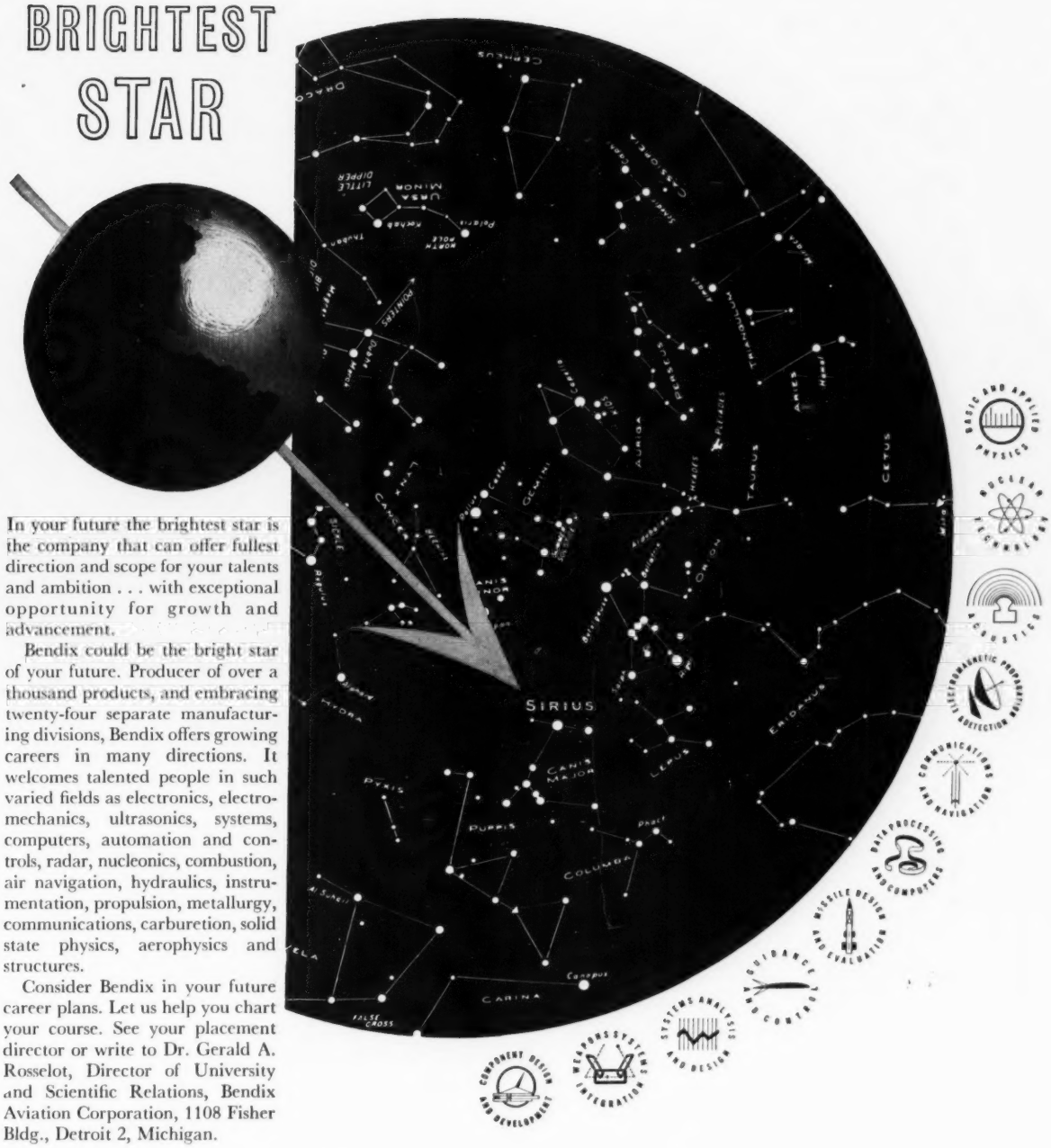

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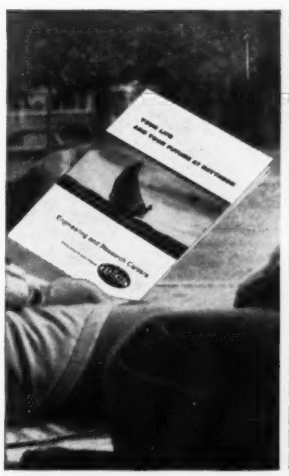

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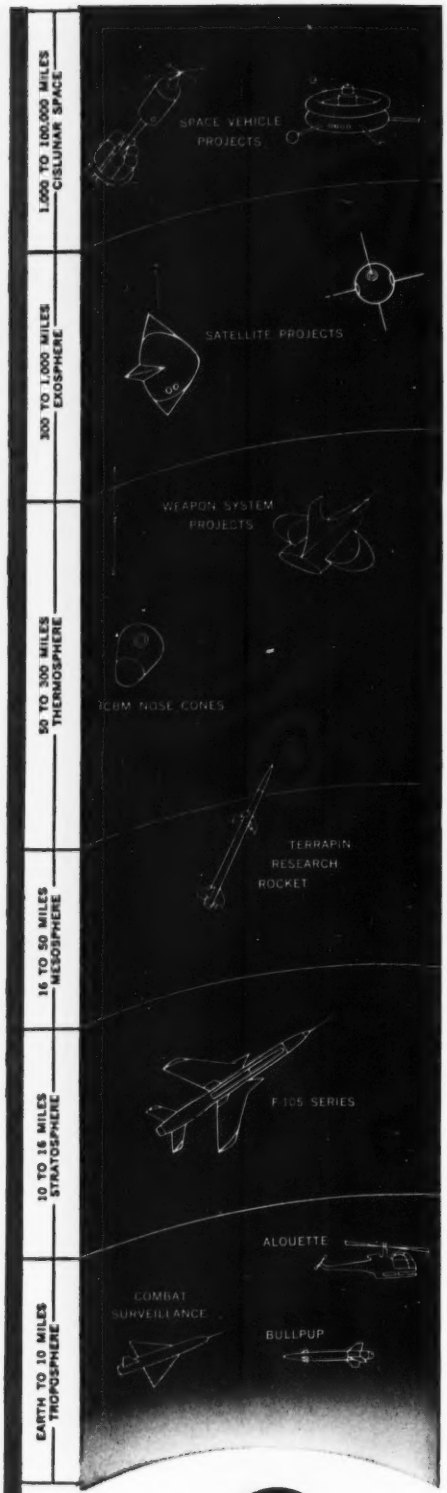

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EDITORIAL . . .

Entering the Profession

The months of February and March will find the upper reaches of Carpenter Hall bustling with activity as the School's fifth year engineers interview prospective employers gathered here from the entire nation. The importance of these two months for those of you graduating cannot be over emphasized. After eight years of elementary school, four years of secondary school, and five years of intensive engineering education at Cornell, you will in this short time make a choice of employers which will influence your entire professional career, and in all probability your personal life as well.

It is with this in mind that the ENGINEER has devoted this entire issue to the subject of engineering placement. We have attempted to cover the entire placement procedure with informative articles providing answers to those questions most frequently asked by graduating engineers: What is the placement situation this year? What field should I choose? Where can I learn about companies? How should I prepare for employment interviews? What are the opportunities of graduate school? What about the military? The articles have been written by men well-qualified to give answers to these important questions.

These articles should also be of interest to you prospective engineering freshmen receiving this issue. With the recession of 1958 and the subsequent easing of the demand for engineers many of you may have wondered whether you were choosing a vocation where a job was difficult to obtain upon graduation. In "Engineering Placement – 1959" the job situation for engineers is outlined in detail.

While graduate school might seem a distant possibility for you as a prospective freshman, it should be remembered that your performance *throughout* your college career will determine whether you can gain admittance to a qualified graduate school. Therefore, the opportunities of graduate school, outlined in this issue, should be investigated. As you plan to enter engineering school at Cornell, actual employment may seem far away. Nevertheless, this issue of the CORNELL ENGINEER will help to introduce you to the profession for which you will soon be preparing. –R.J.L.

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Hermann von Helmholtz...on immortality

"...what arouses our moral feeling at the thought of a future cessation of all living creation on earth, remote as this may be, is above all the question whether all life is but an aimless sport, which will ultimately fall prey to destruction by brute force. In the light of Darwin's great thoughts we begin to see that not only pleasure and joy, but also pain, struggle, and death, are the powerful means by which nature has built up her finer and more perfect forms of life. And we men know that in our intelligence, our civic order, and our morality we are living on the inheritance which our forefathers gathered for us through labor, struggle, and sacrifice; we also know that what we acquire will in like manner ennoble the lives of our descendants. Thus the individual, who works for the ideals of humanity, even if in a modest position and in a limited sphere of activity, can bear without fear the thought that the thread of his own consciousness will one day break."

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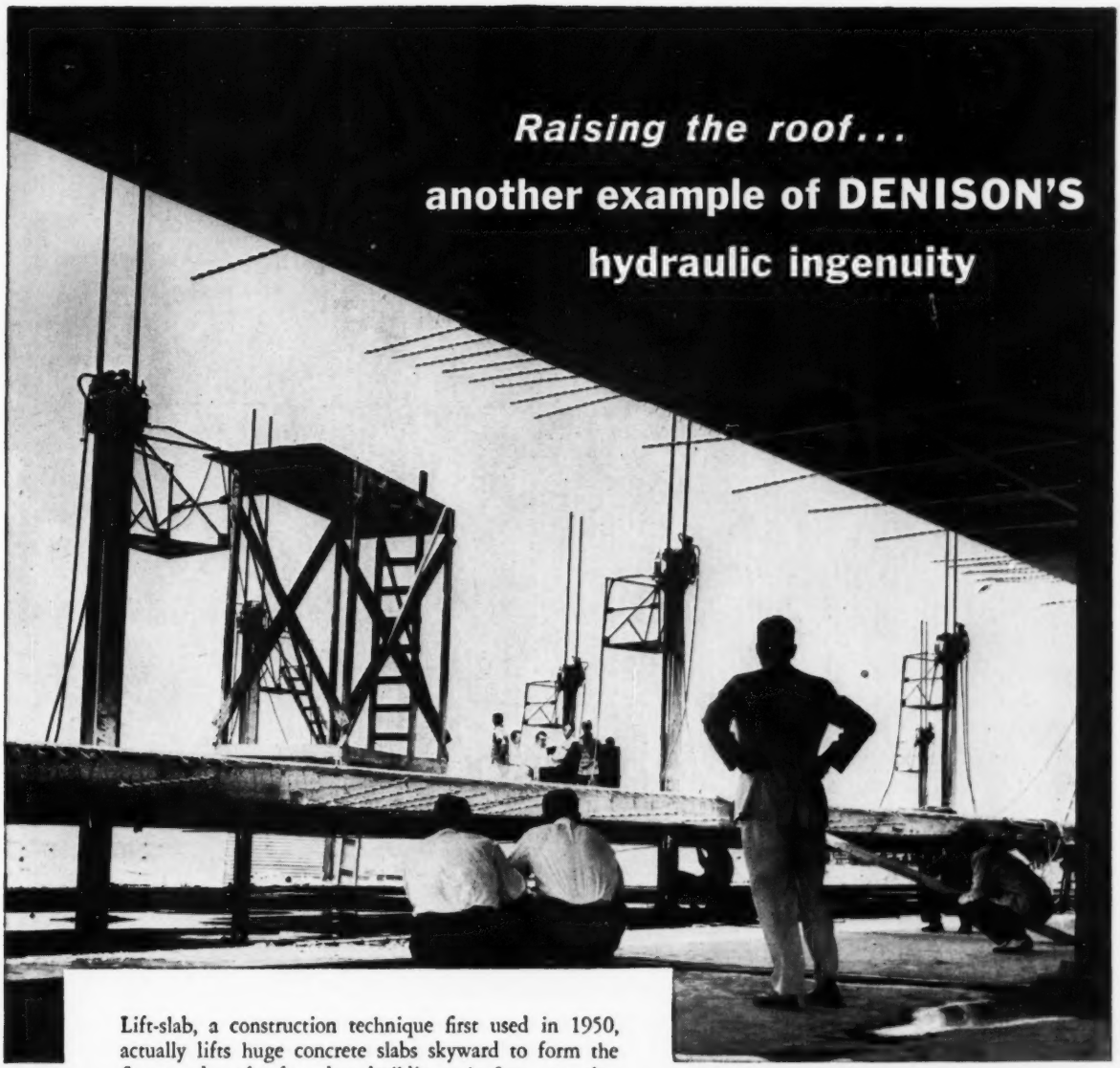

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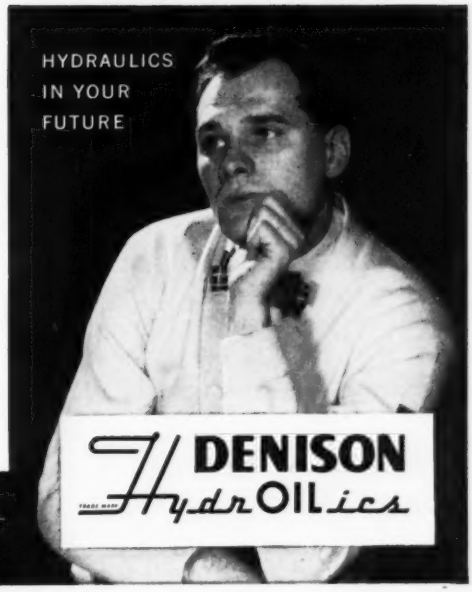

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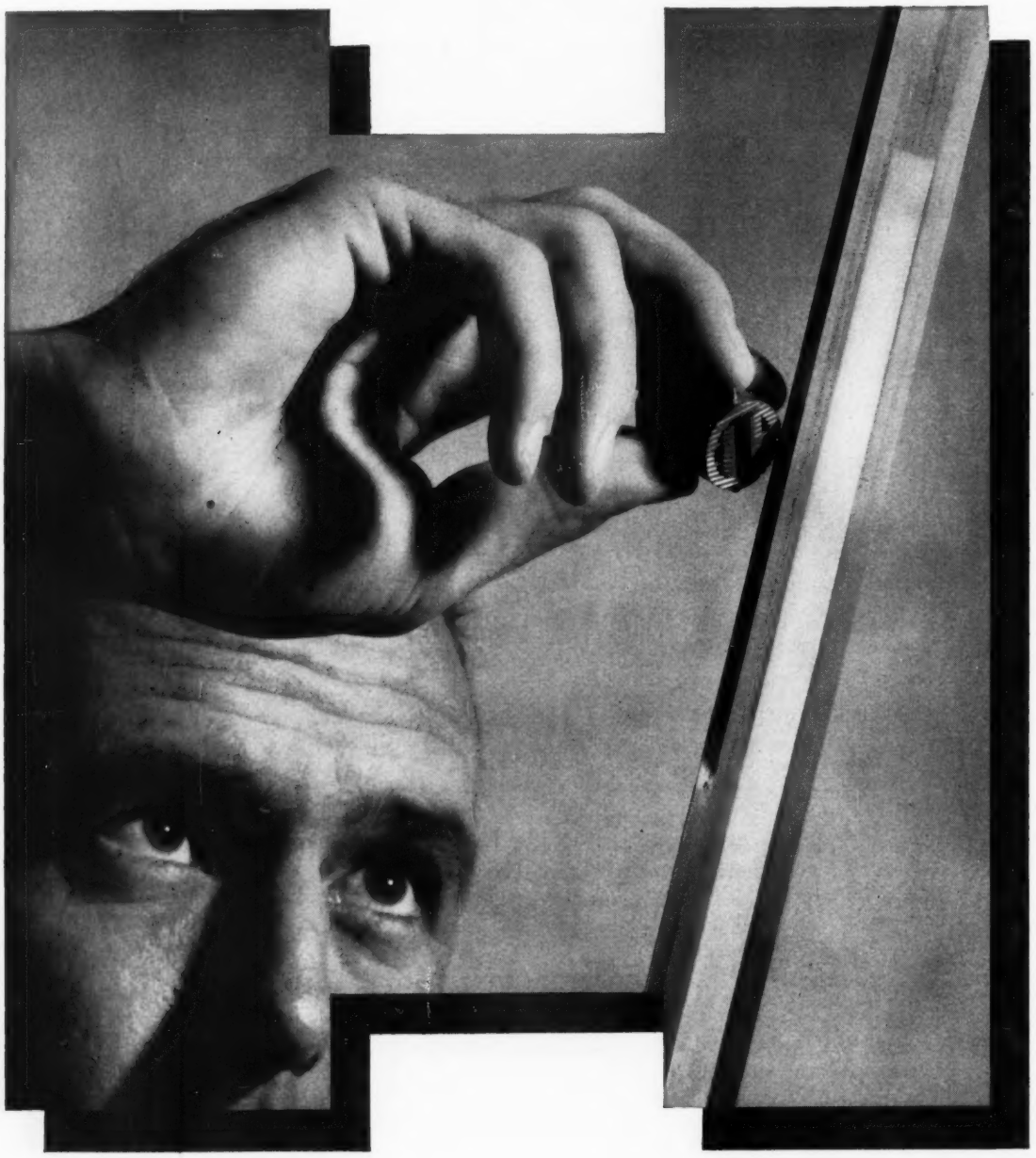

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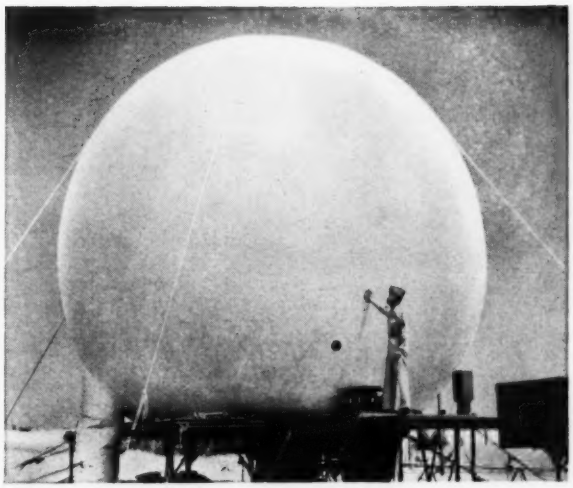

This plastic balloon, *resting on a mobile trailer unit like a golf ball on a tee, protects the new Hughes Frescanar three-dimensional radar antenna.*

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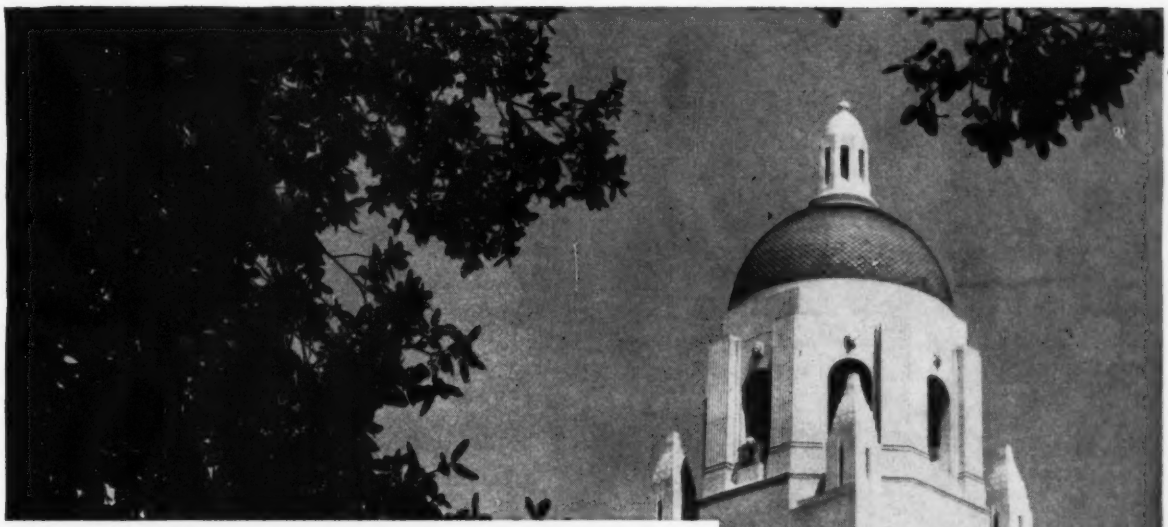

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Engineering placement—getting the right job with the right employer, can be a difficult procedure. Since the choice of position and employer will influence the graduating engineer's entire professional life, if not also his personal life, he should devote considerable thought and preparation before he embarks on interviewing with prospective employers.

ENGINEERING PLA

ACEMENT . . . 1959

by Donald H. Moyer

Since 1950 the placement of engineering graduates has offered a greater challenge to the employer than to the employee. Over five thousand companies have been scrambling annually for an average of between twenty and twenty-five thousand engineering graduates, and in some of these years single companies have sought to hire from 500 to 1,000 or more of this total. For several years at Cornell the companies recruiting engineers have been between two and four times the number of graduates available for jobs. Reflecting this demand, starting salaries for the average Cornell engineer have risen 89%, from $270 a month in 1950 to $510 in 1958.

1958 was a year of recession; the demand for engineers weakened and there were actually some layoffs. Salaries, however, were not only unaffected, but rose somewhat over the preceding year. Thus the picture was confused. However, a trend of some real significance began to emerge; a selective demand for engineers began which promises to continue. The cry now is not so much for more engineers as for better ones.

During the intense competition for engineering graduates which has developed in recent years, many companies have found it both necessary and desirable to train liberal arts graduates or to hire technicians and technical assistants for many jobs previously filled by engineers. At the same time, there is a growing effort to utilize well trained engineers of high caliber to better advantage in work requiring technological competence of a high order. Thus the demand for you as an engineer will depend upon the excellence of the training you have had and how successful you have been as a student; an engineering degree per se is no longer an open sesame to a good job.

Prospects in '59

What specifically are the prospects for engineering recruitment in 1959? Early evidence indicates little change from last year. An accelerated business recovery could add to the demand, but with 10% more graduates available in June 1959 the net result is likely to be about the same. Fewer companies have established recruiting dates than for 1958 placement, but the number signed up is still large, and those for the most part who have dropped out are companies who have recruited at Cornell only in recent years and with little success. Again this year, men in the top half of the class will have little if any placement problem; the below average student will get a job, but it may not be just the job he wants or where he wants it, and to get it he may have to take the initiative and go beyond the confines of the placement office interviewing rooms.

There are three main stages in the recruiting process for a senior engineer; they are preparation, interview, and job offer. The first step involves deciding what you want to do with your engineering education and getting information about prospective employers. Second, is the interview which is your point of contact with the employer and your chance to sell yourself. Last is the period of plant visits and, we hope, offers of employment.

Photo Science Studios

Donald H. Moyer is director of the Office of Student Personnel of the College of Engineering, Cornell University. He is a graduate of Harvard College, A.B. '27, and of the University of Michigan, M.A. (psychology) '28.

The Interview

Before you interview any prospective employer you should have decided first, the kind of job you want; second, the companies where such opportunities exist; and third, which of these companies show the most promise for you. Each School in the College of Engineering has a placement adviser who will help you with the first question. Company information is conveniently available to you in the University Placement Office in Day Hall and

at the Office of Student Personnel in Carpenter Hall. You should become thoroughly familiar with this information before you interview any company representative; your interview will amount to little otherwise, for you will not be well informed and will create a poor impression. To the extent that you are able to supplement the information in the placement office files by the experience of summer jobs, talks with friends, or through other sources, the better prepared you will be for your interview.

An employment interview* serves essentially a twofold purpose; for the employer it affords the opportunity to appraise a prospective employee, and for the applicant it not only provides the chance to sell himself but to make further inquiries about his prospective employer. As the person being interviewed you must put your best foot forward. Needless to say (I hope) you should tidy up for the occasion, and this applies to your person as well as your clothes. No need to be fancy; just use good taste. A poorly packaged product won't sell.

More important is the need to be yourself. One of the main reasons for interviewing you is to find out what sort of person you really are. The minute you try to camouflage your true personality you are being deceptive and will be found out sooner or later; trying to be someone else will only make you look silly, and you can't make it stick anyway. No formula will fit all interviews but at least be on time, be honest, and be alert. It only makes sense to be polite, business-like, forthright, and responsive, and even if these are not your natural attributes, it won't hurt to practice them. But again, if you are a natural born introvert, don't "make like" a back slapping politician.

Learn About The Company

The interview is also your opportunity to find out about the company, and a good interviewer will see that you do. If you go well prepared he will often tell you much that you already know. When he does this, be patient, and when he pauses for breath ask him specifically some of the things you want to find out about in addition to what appears in the company's brochure. Better write your questions down in advance because otherwise you may forget them, and even if you have to refer to a list, your interviewer will know that at least you are sincere, and not just trying to fill in. Remember, however, that your time will be limited to twenty minutes or half an hour, so be selective in the questions you prepare; you may not have time for them all.

Few employers are likely to ask you how much salary you want, and if they do it is perfectly proper for you to retort that you suppose the company has a standard starting rate, which if they are interested in you, you will be glad to consider. To try to evaluate yourself in dollars, lacking work experience and full knowledge of the job market would not mean very much, and a company representative who asks you this question is either trying to trick you or is not very smart.

Finally, if your interviewing has been fruitful, you will have received one or more offers. Recruiters will seldom make spot offers during the interview. Usually the offer will be and should be a written one and it will come either on the basis of the interview alone or after you have visited the company following your initial interview. The time you will have to consider the offer may be mentioned in the letter, but in any case an immediate acknowledgment is called for stating when you will give your answer if you are not prepared to do so at once. If you want more time than the company specifies, you may request it, but remember they have other prospects to consider.

An offer is not an irrevocable commitment to hire; it may be withdrawn at any time prior to your acceptance or rejection of it, and this happened a number of times last spring. A high acceptance rate of offers or the sudden reduction of personnel requirements in any company may necessitate a withdrawal of outstanding offers, much as any employer would like to avoid such action. Therefore, when you receive any employment offers this spring, remember there are two parties concerned and that your convenience is not all that counts. Almost any company wants you to have a fair opportunity to reach a considered

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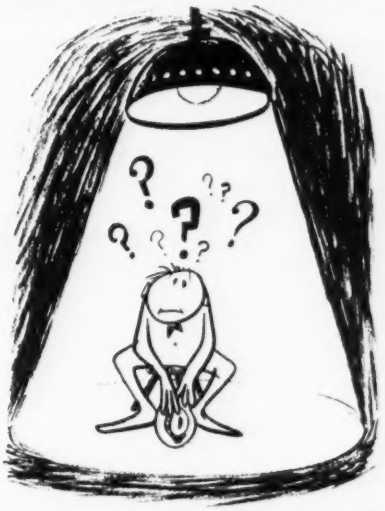
Norman Brockmeier

The bulletin board in Carpenter Hall serves as the starting point for the Cornell engineer's search for job opportunities. Pictured are charts showing companies in search of prospective engineers. The board also gives detailed information on starting salary for Cornell engineers.

* An excellent booklet entitled, *Your Job Interview*, has been published by the New York Life Insurance Company and is available for distribution in the placement offices in Day Hall and Carpenter Hall.

UNIVERSITY RESOURCES AVAILABLE IN PLACEMENT

by John L. Munschauer



The graduating engineer, looking for a job, is placed "in the spotlight" by prospective employers. It is the job of the University Placement Service to make sure that the graduate picks the right employer's spotlight, by making available varied literature on all "spotlights of opportunity."

University resources available to engineers in their search for the right job are many and varied. Unfortunately, many graduating seniors are not familiar with these resources and thus deprive themselves of information of significant value as they seek out the right job with the right employer.

This process of job hunting can be compared to marketing. Lists of potential customers (employers) must be collected. For the engineer this is an easy task. The University Placement Service, in cooperation with college offices, publishes a list of employers who will recruit throughout the campus. It also distributes a directory called the *College Placement Annual* which lists most employers who recruit college students in the United States. A supply of these publications is kept "in stock" in the Student Personnel Office in Carpenter Hall, as that is the focal point of engineering placement.

Market Research for the engineer will probably not be a problem of finding lists of potential employers, but of cutting the existing ones to a manageable number of prospects. For the very few who do not find the kind of employer they want in standard employment publications, there is a media available for advertising qualifications. The Placement Office publishes a bulletin (and to be included in this one the engineer must come to the office in Day Hall) which outlines the qualifications of students and is mailed to over 3,000 employers.

Obviously, the salesman in this procedure is *you*, the applicant. If sales techniques need to be sharpened, the Placement Offices have books on the subject of interviewing and Mr. Moyer or myself will try to help.

The Interview As A Market Place

Fortunately, there is a market place or exchange which attracts many of the finest employers so that the greatest inefficiency in job hunting, making calls on employers, is eliminated. This exchange is, of course, the interviewing facilities in Carpenter, Olin, and Day Halls. During the months of February and March, when employers visit, the engineer can avail himself of the opportunity to interview employers from New York to California and Minnesota to Texas. Hundreds, if not thousands of dollars in transportation costs can be saved by interviewing on campus. This brings up a special point for men entering military service. Interview at Cornell—never again will so many employers be assembled in one place. If entering the service, use these interviews as a means of establishing a file or record of qualifications with various employers which can be reactivated at the end of the tour of duty.

The last step in the process is the decision—taking the plunge and accepting a job. Here the engineer stands alone and must make up his own mind. For some, the decision is easy—only one job offer. For others, there will be many factors with variables to be weighed for each individual's likes, prejudices, and wisdom. Some will compromise standards in order to work in a certain locality, and some may compromise everything to marry the boss's daughter (an excellent road to success).

In the Placement Office in Day Hall we have ventured to develop a list of factors to be considered in rating an employer, and this is available by calling on our office. Basically, it urges students to look into an employer's products, research, marketing, manufacturing, finances, and profits, as well as personnel development and compensation programs. The advice is quite similar to that used in the purchase of securities.

We conclude, however, with a

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Photo Science Studios

John L. Munschauer is Director of Placement for Cornell University. He received his A.B. in '40 from the University.

FIELDS OPEN TO THE ENGINEER

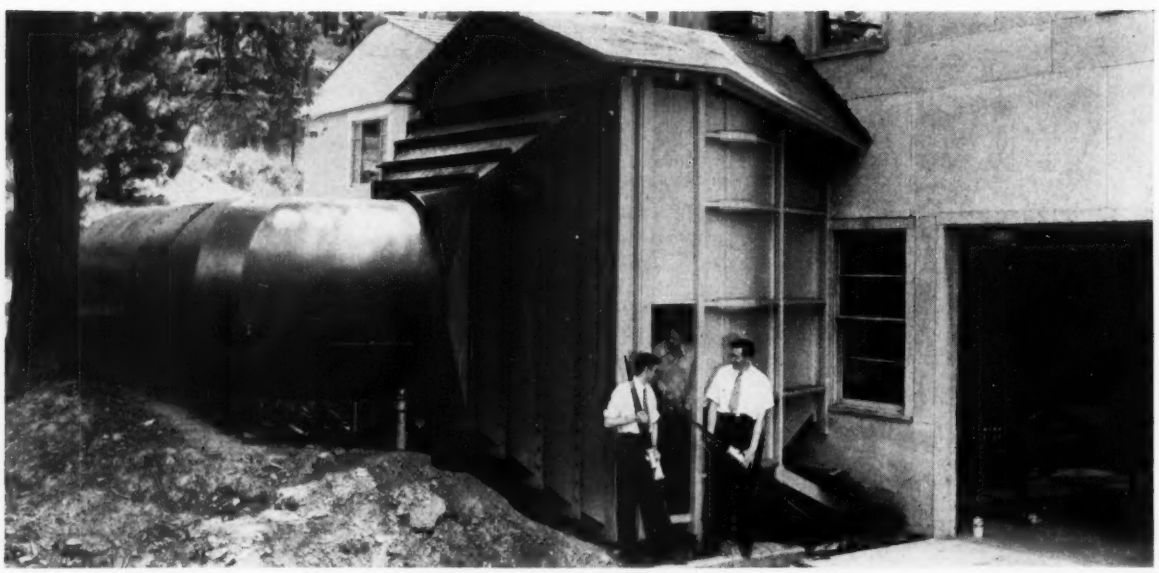
by Professor Andrew Schultz, Jr.

The engineer receiving his first degree is faced with a major decision—his selection of a particular field of endeavor. This is as important a decision as his prior choice of college and field of study. There is no doubt that today's graduate has a field of choice, as far as his post-college career is concerned, that is most challenging to the individual.

In contrast to his father who graduated during the thirties, when jobs were hard to come by and the major question faced was often not a decision as to which job to accept but how best to obtain any offer, the graduating student today is forced to select and is usually able by his decision to choose a career in whatever field, industry, or specialty he prefers. Each year a significant number of students are unable to make this decision however, and by default allow others to decide for them.

Therefore, some advice on the topic is presumably appropriate, for any aid in the decision procedure is usually welcomed. The purpose here is to discuss some of the alternatives open to a Cornell engineer and call attention to some of the aids and resources available to him so that he uses them before it is too late. The timeliness of the decision is important. While still a Cornell student, resident on the campus, and not yet graduated, the young engineer is sought after, inspected, appraised, followed up by all forms of direct mail and telephone solicitation, and apparently is a highly desirable commodity.

After graduation he will find himself to possess an entirely different value. He will have difficulty in arranging interviews, will receive few answers to his letters of application, and will find that obtaining a job in the outside world "over-the-counter" is an entirely different proposition. Similarly, those students who approach industrial firms during their vacations with the idea of obtaining information concerning career possibilities often find ready access to executives' offices and receive the red-carpet treatment in their status of student. But the treatment received three months later in their status of job applicant, is, in the



One of the possibilities open to a graduating engineer is further study in graduate school. The question of proper field, program, fellowships, and teaching and research assistantships makes the choice of the right graduate school as difficult as that of the undergraduate school. These students are working on a research project at the University's Graduate School of Aeronautical Engineering.

best of firms, quite different. The moral to be drawn is that the decision is best approached, in the most favorable environment as far as opportunity is concerned, prior to graduation. This applies especially to those individuals who are faced with a period of military service.

Many Cornell engineers elect advanced R.O.T.C. and thereby assume some obligation for a period of military service after graduation. Regardless of the time or length of service, the student who neglects the opportunity to interview and establish relations with industrial firms during his last term of residence is losing a golden opportunity and making his post-service employment problem immeasurably more difficult than it need be. Therefore, no student should neglect the opportunity to interview on-campus merely because he is in the R.O.T.C. and has a military commitment facing him. Most firms are eager to interview him, and many will make offers immediately or after completion of service.

The Engineering Specialist

A variety of methods for approaching the decision are possible. All of these which are both logical and feasible involve considerable thought and preparation prior to the actual contact with industrial firms or other potential employers. The first step is study and consideration of possible alternatives. These must be subjectively defined by the individual facing the problem if a wise decision is to be made. A good starting point is to consider whether a career as an engineering specialist, research worker, or teacher is appealing. Such a career implies great technical competence and abilities in the direction of science as well as engineering. There exists a stronger tendency to pay well competent engineering specialists, and the paths to higher management for such individuals are evidently broadening.

Many young engineers are able to make this decision prior to graduation, based upon their experience in the class-rooms, laboratories, and summer jobs. Those at the extremes academically often find the decision easy. Individuals at the bottom of the class usually reject this type of career. While those at the top, find it worthy of further consideration. For those who consider such a career with favor, additional study in graduate school is clearly advisable. There are an increasing number of fellowships and teaching and research assistantships available in institutions of higher study each year and early consideration of specific field, institution, and program is required. Most graduate applications for financial aid are acted upon in March. Application to those graduate schools selected should be made early, even if a final decision has not yet been reached.

At Cornell the number of engineering students entering graduate school immediately upon graduation has increased in the past five years from thirteen to 21 per cent of those reporting to the placement office prior to graduation. Additional men matriculate at graduate schools after completing military service, and many others undertake part-time graduate study while employed at their first jobs. There is no doubt that an increasing proportion of Cornell engineers take graduate degrees and find employment in more specialized technological areas. Part of this is undoubtedly due to the general trends of the time, but there undoubtedly are a significant number of students who find in their fifth year an opportunity to appreciate the challenge of analytical work and decide to pursue the idea further. Many of them take advantage of current economic conditions and the recruiting procedure to line up challenging summer jobs which provide an opportunity to appraise such a career. So this group also finds it necessary to make decisions concerning employment.

The Professional Master's Degree programs at Cornell should be investigated by those individuals planning to continue study prior to graduation so as to take advantage of the elective programs possible in the fifth year which can be applied toward such degrees. In fact, students considering graduate study elsewhere would do well to apply for one of these programs as well as would those planning to go directly into the service prior to graduate study. Such application will make possible later realization of full credit for appropriate advanced work taken in the fifth year.

Fields Usually Open

For those who decide not to go to graduate school, a difficult decision remains. From experience in discussing the problem with many students one is led to believe that it is most productive initially to think in terms of a classification of type of work. A starting point is suggested in the following list of functions:

(1) Research
(2) Development
(3) Design
(4) Technical Staff Related to Operations
(5) Production or Operations (Technical)
(6) Technical or Engineering Sales.

The terms used do not represent an attempt to coin new phrases, but do attempt to eliminate certain words which have vastly different meanings in different environments. Research is distinguished from development and design and is used in its purer connotation. Each student should study the meanings of these terms in dictionaries and as they are used in practice. (Reading of the brochures and technical publications of the various firms will help indicate the

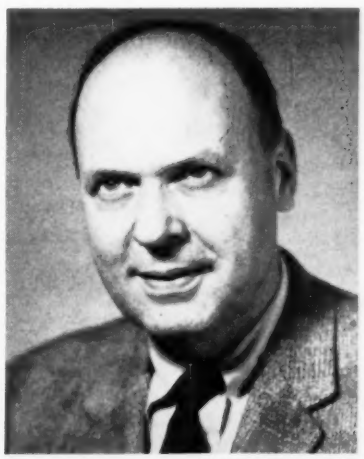


Photo Science Studios

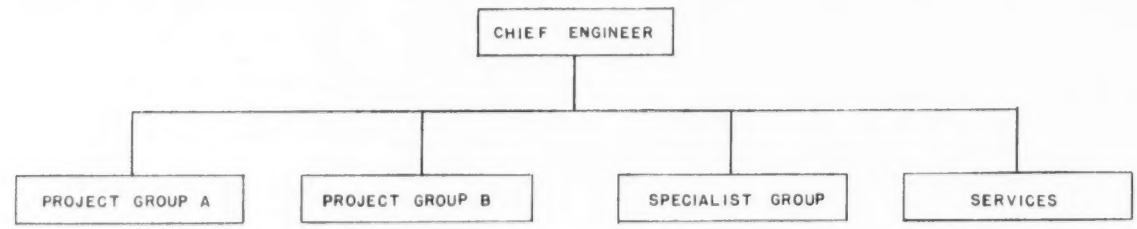
Professor Andrew S. Schultz is head of the Department of Industrial and Engineering Administration of the Sibley School of Mechanical Engineering. He received his B.S. from Cornell in '36 and his Ph.D. also from Cornell in '41.

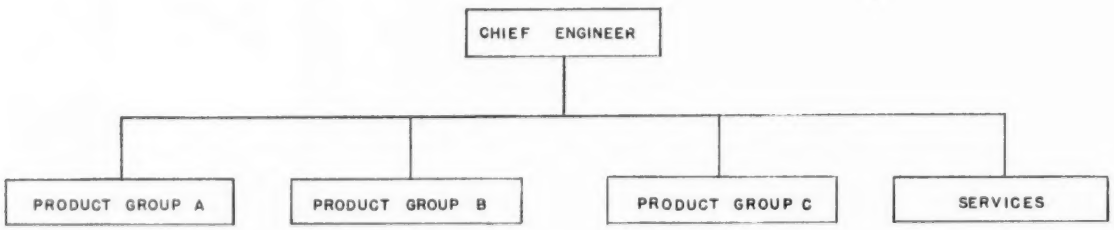
latter meanings.) Only then will he be able to discuss and appraise intelligently various opportunities that may be available to him. The somewhat lengthy term *technical staff related to operations* is used in place of the many different terms such as process engineering, industrial engineering, manufacturing engineering, production engineering, engineering planning, etc. because it is descriptive and applies to process, mechanical, or electrical industries, to service industries, and other areas of endeavor all of which use different terms to describe the general function. The term *operations* is used in the next category to include service, communication, transportation, and oil industries where the term production is not used or has a different meaning than in manufacturing. The term *technical or engineering* sales implies more than selling and connotes the true technical challenge associated with the solution of highly complex industrial problems by sales representatives.

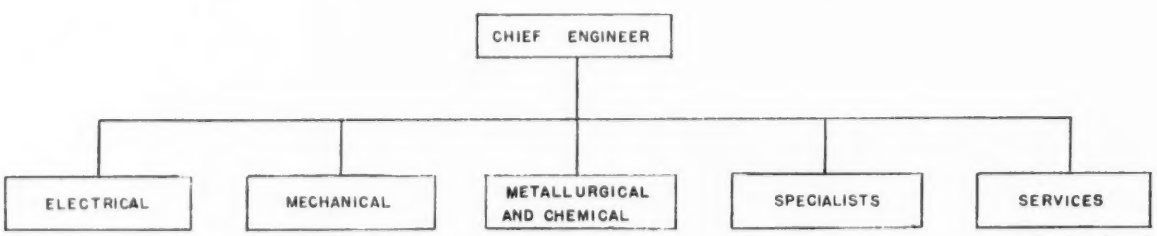
Making The Decision

The most difficult part of the process for many students is deciding which of the types of work listed appeals most. In general those unable to make a selection are also unable to define clearly and intelligently what each involved. Lack of ability to define inevitably means lack of ability to relate specific types of work to one's personal inclinations, desires, abilities, and education. Thus the first step is to define clearly, in terms that are meaningful to the individual, in terms that will enable the individual to properly orient industrial opportunities presented, and in terms which enable him to appraise such opportunities against his desires.

Luckily, most Cornell graduates have had two or three summers of significant experience, come from a home in which the industrial or business environment is discussed, and have some feeling for what the various occupations involve. Others apparently lack either the imagination or the experience to make a clear appraisal of what the functions involve. A suggested aid for such individuals is to list the functions on a long work sheet and then across the top of the sheet set up three broad classifications: (1) mental demands of the job, (2) job environment, and (3) human relations. Within each of these can be set up ten or fifteen column headings which state various characteristics in each class. For example, in the first category a listing would include such items as: analytical ability required, originality, imagination, dealing with abstractions, ability to gadgeteer, mathematical demands, etc. Similarly, under environment would appear: travel, work in noisy area, seclusion and quiet, pressure and tension, frequent moves, etc. Under human relations such topics as working alone, close cooperation with small group, make good first impression, politics important, etc. should be mentioned. Many others can be suggested. Once such a







Stephen Garrell

From top to bottom: Figures 1a, 1b, 1c. Three of the most popular engineering organizational arrangements are shown diagrammatically.

form is prepared, each of the types of work listed should be evaluated against the column heading. The purpose of such a check sheet is not to indicate a selection but merely to force the individual to educate himself in the demands of the various occupations.

Once completed, of course, a decision is suggested. At the least, certain areas can be excluded. It is doubtful if many can select a specific type of work as preferable to all others, but one or two can be set up as superior in interest and challenge. The problem is initially to select from among the hundreds of firms recruiting those which offer the types of work desired and from those the firms which offer the best opportunity for income, for advancement, and for highest quality endeavor.

Other Sources Can Be Of Aid

Many students face the problem with some trepidation and fail to prepare themselves properly. Such individuals generally have an alibi which most frequently is in terms of lack of experience. What is not recognized, is that an individual cannot possibly experience all types of work, and, therefore, decisions must be reasoned rather than based on pure experience. The considerable resources available to the average student are frequently not recognized. In addition to home environment and summer work experiences, there are family friends, class mates, classroom experience, a multitude of technical periodicals and company publications in the library and in the placement offices, interviews that may be arranged with industrial personnel during vacations, and, last and not least, an informed and intelligent faculty.

Family friends are in a position to advise in the light of their experiences and to tell what their jobs involve, what is interesting to them, and why they enjoy their jobs. Class mates have had summer experiences in different firms and jobs, and other friends currently employed may be able to inform a questioner of facts concerning their employer. The company publications provided prior to the recruiting date often provide a wealth of detail about the firm, its organization, and types of job available. The Faculty of the College can draw upon years of experience as well as knowledge accumulated from alumni who made similar decisions. This is a most important resource to cultivate, both for purposes of decision and in order to have appropriate references after the decision is made.

Some students have an easier task than others in the selection of industry and firm. The student interested in electronic design starts out with a much smaller list of possibilities than the man concerned with a staff position related to technical operations. The latter may need to look at all types of industries in order to narrow the field, whereas the electronic designer has fewer possibilities. Thus it would be expected that the mechanical engineers, for example, would on the average interview far more firms and have a more difficult selection problem than the electricals or engineering physicists. Some general criteria helpful in arriving at a decision would include growth trend of the industry, position of the firm within the industry, growth trend of the firm, policies of the firm with regard to treatment of engineers, and promotion of employees.

Learn How a Company Functions

Most opportunities have some peculiar characteristics, and these should be ferreted out. For example, certain government engineering jobs may lead to considerable responsibility faster than comparable industrial positions. In some firms promotion policies may open doors to faster advancement in certain fields. In other firms forecast output increases will not require a significant personnel increase. Offsetting this may be an excessive proportion of older managerial employees, thus providing opportunities for fast advancement.

Perhaps a crucial characteristic to the engineer is the type of engineering organization of the specific firm being considered. For example, some firms have a centralized engineering organization while others are decentralized with engineering and development responsibility spread throughout the organizational structure. Depending upon the size of the component divisions, this has clear implications as far as the development of an engineering specialty is concerned, and as far as means of advancement are concerned. Such questions should be thoroughly investigated.

The internal organization of the engineering development function is also critical. Figure 1a shows a type of organizational arrangement by engineering specialty; figure 1b shows a department organized by product line; and figure 1c shows an organization by projects in which the personnel assigned to projects varies according to demand and capability. There are different implications in each of these three types of organizational pattern as far as variety of work, ability to develop highly specialized knowledge, types of work assignment, and methods of advancement are concerned.

Also worth checking in any type of organization is the degree of service back-up provided. This cannot be observed from the organization chart but must be determined otherwise. In some engineering organizations the individual engineer is provided with little or no assistance and does all of his own computation, set-ups, drafting, correspondence, reference work, etc. In others, computing aids, technicians and mechanicians, library resources, and other services are provided and expected to be used so that the engineer devotes his time strictly to his engineering problems. Policies of liaison with other agencies, of attendance at technical meetings, of publication of papers, and similar professional activities are most important to the engineer planning on a specialist's career. On the other hand, the individual contemplating ultimate management responsibility is more concerned with the breadth of the job and the opportunity to progress up the organization line. Most of these questions are initially checked by reading the information sent by the employer prior to the interview, further answered in the interview, but really not settled until the applicant has an opportunity to observe the organization itself. For this reason, the student must be prepared to observe effectively during his trips to the employment scene. Op-

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GETTING THE MOST FROM THE EMPLOYMENT INTERVIEW

by Elton T. Barrett

When you are interviewed by a prospective employer, you will want to convince him that you would make a good employee and induce him to make you the highest salary offer he can. In this endeavor you must rely on your ability to sell yourself. For most engineers today, the employment interview offers just about the only opportunity to accomplish this. Its importance, then, cannot be overemphasized.

In the employment interview you are selling an important product—display it in a good package. Careless dress may create an adverse impression with the interviewer. Dressing well will not get the best engineering job for you. But failure to dress well could keep you from getting it.

Things The Interviewer Looks For

Before discussing the interview, it may be well to consider what the interviewer is likely to be looking for. Usually, the answer is simple—he's looking for someone who can make money for his company. The specific factors that will result in your making money for his company are more difficult to define, and there is considerable difference among the opinions of different employers.

Bachrach

Elton T. Barrett is President of CGS Laboratories, Stamford, Connecticut. He is a graduate of Northeastern University Law School.

We can only list some of the things that we look for in new employees for our company. We are justified in doing this, because it provides one specific example, and because in general, other employers give consideration to much the same factors.

First, we try to guess as well as we can how you will get along with other people in our company. If we draw the conclusion that you will not get on well with our other employees, it is almost disqualifying. We say "almost disqualifying" because we don't like to think any one factor is in itself wholly disqualifying, but it would take other outstanding abilities to overcome this drawback.

We are interested also in the degree to which you possess scientific or intellectual curiosity, particularly if you are being considered for development work. A well developed sense of curiosity seems to be an attribute of most good engineers.

An important requirement is a thorough knowledge of fundamentals. In general, we find that students with a highly developed sense of curiosity have a better knowledge of fundamentals, perhaps because it takes considerable curiosity to induce the student to ponder the basic behavior of nature enough to develop a broad and deep understanding.

The ability to apply reasoning in terms of the fundamental behavior of nature to seemingly complex problems is an invaluable asset, albeit a rare one, to anyone in the engineering or scientific field. It is our experience that if the student leaves school without a thorough and deep understanding of these fundamentals, he will not later acquire that understanding. He will not be likely to become an outstanding development engineer. A knowledge of advanced courses is useful only to the engineer who has a thorough and penetrating knowledge of the fundamentals to which he was exposed in his freshman and sophomore years.

Another factor that we consider of substantial importance in an engineering applicant is his inventiveness. Some engineers are certainly far more inventive than others, but it is difficult to determine even from a series of interviews just how inventive an applicant may be. Inventiveness is not easy to define or easy to measure. It is undoubtedly related to imagination and it may be that a highly developed sense of imagination is a prerequisite to a high degree of inventiveness. It may be that inventiveness is something you are born with and does not develop through education or training.

There are different types of inventiveness. For example, certain individuals have unusual ability in recognizing problems. Such individuals continually discover many problems which they think can, or should be solved. This same person may or may not have outstanding ability to solve the problems he has recognized. Other individuals with a poor sense of problem recognition, may be highly adept in solv-

ing problems which have been pointed out to them.

In general, then, these are the things we try to determine about a prospective engineering employee. The illustrations are representative of some of the questions that we ask in an effort to predict whether an applicant will make money for our company.

The Employment Interview

Presumably, an employment interview is set for a certain time. In social life, it may be tolerable, or even fashionable, for you to arrive a few minutes after the appointed time. Industry operates on a time schedule that allows no such latitude. If you have made an appointment for a certain time, be there!

Usually, the company representative takes the position that he is "conducting" the interview, but the interview is as important to you as to the company. Perhaps it is more so. The company can have many employees. You can have only one job. Ordinarily, the interview starts with the company representative asking questions of you. The impression the representative carries back to his company depends largely on the way you answer these questions.

It is of primary importance that you be scrupulously honest in your answers. This does not refer to deliberate or conscious lying. Rather, it is a caution against unconscious rationalizing or careless excuse making. Said another way—don't try to "snow" the man. As an example, suppose the interviewer asks you a question. You don't know the answer, but you do know that it was covered in a sophomore course and the answer should be obvious.

You are in trouble. You can excuse yourself by pointing out that it has been two or three years since you took that course. You can also remind the interviewer that the courses of study are so heavy in college that by the time you are a senior most of the knowledge from earlier courses is buried under layers of advanced courses. As another alternative, you can change the subject, for example, by pointing out that this is closely related to "so and so." You can hope that when you have finished discussing "so and so" the interviewer will have forgotten the original question. Or you can give him a cursory answer using plenty of technical words and hope the interviewer will not detect that you don't really know the answer. You can think of other ways to handle this situation equally adroitly.

The fact of the matter is that you are in trouble because you do not remember something you could reasonably be expected to know. The danger is that you may make matters worse by trying to "maneuver." The answer that will do most to minimize the damage is a straightforward "I don't know" without excuse or apology. This answer may not damage you as much as you think. First, because the interviewer isn't going to expect you to remember everything you have studied, and secondly, because he may note under your favorable characteristics your ability to say "I don't know" when the circumstances require it.

Prepare To Talk About Yourself

The interviewer may ask you to tell him about yourself in your own words. You should do this clearly, concisely, and in some logical order. You are likely to be able to do this only if you have thought about it ahead of time and separated the relevant material from the irrelevant. In deciding which things to include, you may wonder what information the interviewer would like to have.

Your best guide is this. The interviewer wants to know what kind of person you will be to work with. What kind of a member of the community will you be? The interviewer will want to know where you were born and what kind of a family life you had. By telling him how you have spent your time both at work and play, from childhood up to the time of the interview, you give the interviewer the best possible guide as to how you will spend your time in the next few years. This is an important part of the interview and is a chance for you to make a good impression by giving him a well thought-out and concise summary.

Another question the interviewer may ask you is what you think you would like to be doing a few years from now. To the interviewer, this is likely to be a revealing question, and the impression you make in answering it is not likely to be a good one unless you have given it considerable thought in advance. You may hesitate to answer this because of your uncertainty and the likelihood you will change your mind later on. Because you may change course later is no excuse for the absence of a planned objective now. One caution on this point—be as truthful as you can in your an-

Norman Brockmeier

A chance to sell himself is being offered to this fifth year man, as he enters the door of one of the several interviewing offices in Carpenter. His interviewer will look for such qualities as character, personality, reasoning ability, and inventiveness which would make him an asset to his company.

swer. Don't decide upon an answer because you think it will make the best impression on the interviewer. It is not likely that you have any idea what answer will make the best impression on the interviewer. An answer in which he detects any insincerity will not impress him favorably.

Related questions may be asked in many different forms and these sometimes encourage unnecessary rationalization. For example, you may be asked questions like these:

1) What do you expect to get from your job?

2) Why do you want a job?

3) What do you think is our reason for being in business?

4) Are you primarily interested in the professional aspects of the job?

5) Is it your primary desire to advance yourself professionally?

The common denominator in all of these questions is money, but it is surprising how often a college student is hesitant to use the word "money" in any of his answers. Irrespective of what is said in government bureaus and educational institutions, in the world of industry there is no stigma attached to the goal of making money. The reasons for the existence of business can be couched in many fanciful phrases, likely all partially true. But none are quite so near the truth as, business exists to make money and makes money because it has employees who want to make money. Therefore, if an interviewer asks you why you want a job, the honest answer, "To get money," will be well received.

Of course, there are other things that you want from a job besides money. Most young engineers want an opportunity to build a background of useful knowledge. They want to have an opportunity to participate in the operation of the company. They want recognition for the services they perform. You should consider in advance what you expect from your job and be ready to state it concisely.

Have Questions Prepared

Earlier it was said that the employment interview is at least as important for you as for the company. If, as suggested above, you have a planned objective, you are in a position to make use of the interview as one step in finding out whether this particular company is the one most likely to help you attain your objective. Not all companies are alike. Opportunities will differ greatly from company to company, and you can learn much about them at the employment interview. The interviewer will not resent your questions. If he does, you have already learned something about a company that sends out a representative with so little understanding of business fundamentals. What sort of information should you be interested in? Here are some questions that will yield useful information and perhaps they will suggest other questions you may want to ask.

"Who owns the company?" This is important because if it is a closely held company, you will want to investigate independently the personal reputation of the owner or owners. If it is a subsidiary of a larger company, you will want to explore the reasons why the larger company has this subsidiary and what plans they have for it.

"Who really controls the company?" This is important because this is the person or persons who formulate policy and likely are responsible for making a profit. You will want to find out something about these people too before you accept a job offer.

"Does the one who controls the business understand engineers and engineering problems?" This is important because there may be a language barrier, or there may be obstacles in the way of engineers advancing into responsible executive positions.

"How do you determine salaries and increases in salaries?" You want to know whether this is by merit or by formula. Sometimes it may seem from the answer of the interviewer that increases are based on merit, whereas, in fact, a formula, even though not recognized in writing, is applied to keep the salaries "within reasonable brackets."

One further question may throw some light on this. "Will you tell me the salaries of the highest and the lowest paid engineers in your company who have been out of school, say, five years?" This is a perfectly proper question, and if the interviewer does not have the information, it is proper to ask him to send it to you. If the bracket is narrow, a yard-stick other than merit is being used, or the company is unusual in its ability to employ equally qualified and industrious people.

"Are all of your financial statements and balance sheets open to all of your employees?" This is important because you will get more satisfaction out of a business where you know the whole story about the company. You can't intelligently help do the planning in a company that keeps facts secret from its own employees. No bank will loan money to a company that keeps its books closed. Why should you work for it?

"If I picked at random the names of several of your employees, will you make arrangements for me to talk with each of them alone?" The best way to find out about a company is to ask the man who works there. This is a reasonable request, and you would be justified in disqualifying any company that hesitated to grant such a request.

If you expect to do development work, you may want to ask, "If I make a worthwhile invention, how do I share in it?" The company is paying you to make inventions and is entitled to assignment of your inventions. Some companies make nominal payments for each patent filed in your name. Such payments may run from $5.00 to as high as $100.00. If you regard yourself as particularly inventive, you may want to investigate companies that in addition to such fixed payments, pay you a percentage of any money they make on patents from your inventions. You will also want to know what happens to these payments if you leave the employ of the company.

"Are the profits of the company growing steadily, and could I see copies of your annual statements for the last few years?" This is an important question because it is important to all employees that the company make a profit. A company to be successful must pay its stockholders a return on their invested capital. It must continue to make the jobs of its employees secure,

(Continued on Page 63)

W.E. DEFENSE PROJECTS ENGINEERS are often faced with challenging assignments such as systems testing for the SAGE continental air defense network.

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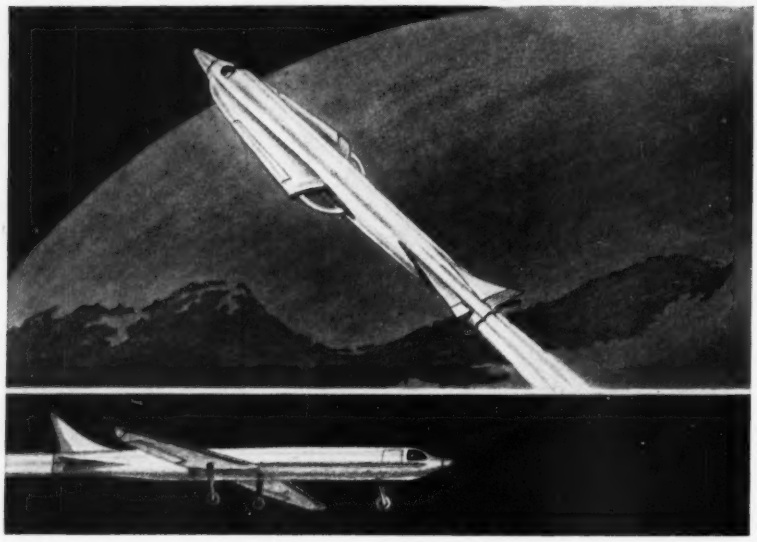

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ENGINEERING PLACEMENT

(Continued from Page 16)

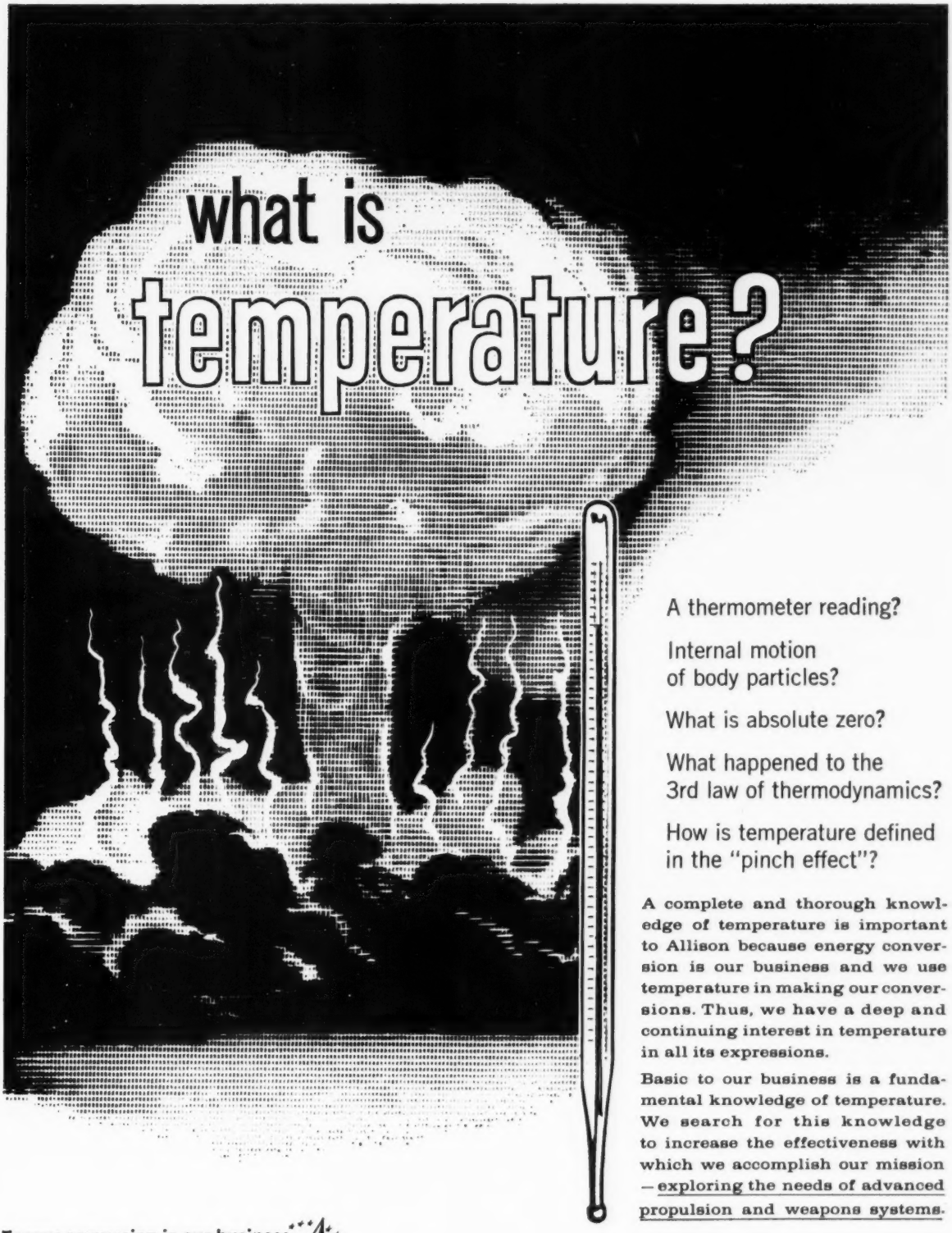
judgment on their offer, and most will not insist on an answer until near the first of April, but in any instance you will have to play the timing of this by ear and realize that something of a gamble is involved.

Salaries

Median monthly starting salaries for Cornell Engineers last June ranged from $490 for civil engineers to $535 for chemical. The median for all graduates of the College was $510. While salaries may inch up a bit this year, most will probably fall between $475 and $550. Bear in mind that salaries will vary with your summer, co-op, or military experience, not to mention how successful you have been as a student. Any comparisons you may make with salaries offered your friends must allow for these factors, and remember that a median salary of $510 means half were below that figure.

The foregoing discussion relates only to some of the more salient factors of recruiting with the interview in the placement office the point of focus. No attempt has been made to expand upon the vital question of vocational and company information, or indeed to explore in any depth the equally important subject of the interview, its significance and techniques. By the same token, other aspects of job placement have been omitted or neglected. For example, any college senior who wants a job is well advised to supplement his placement office interviewing with a well planned program of letter writing and visits to companies undertaken on his own initiative.

These further steps may not be necessary. Yet, sometimes they are, and often the enterprise inherent in them pays off handsomely in job opportunities which may never be brought to the attention of any placement officer. Opportunities in small companies are a case in point. Such jobs are not well publicized, no brochures are available, no interviews are arranged in the placement office, but some of the richest plums are here for the graduate who shows initiative, ambition, and the imagination necessary to ferret them out.



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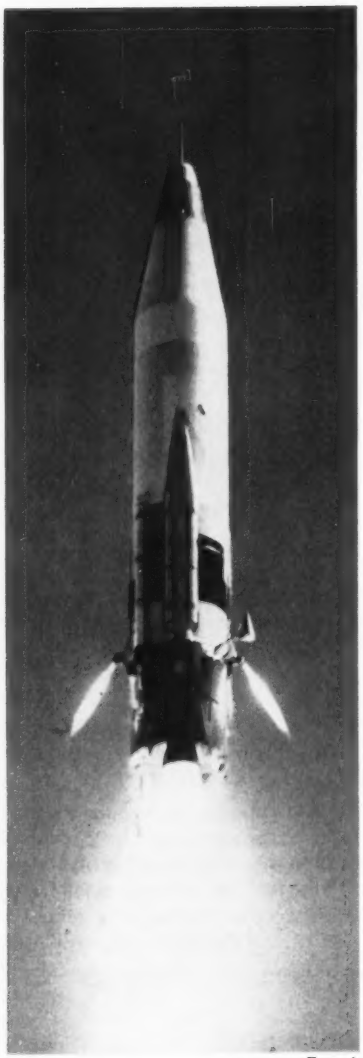

Convair

Military engineers contract about 40 billion dollars yearly, a portion of which goes into research for rockets like this one. The number of graduates assigned to research engineering positions, however, vary with the needs of the service.

Ever spend a million dollars? Probably not, but this happens to be the engineer's lot in the Air Force. Current military spending approximates 40 billion dollars yearly. The Air Force's research, development and procurement projects are responsible for translating a major share of these funds into military necessities. Who contracts for these purchases? You guessed it, the Engineering Project Officers! Naturally, there are contract countersigners, but the basic decisions are made by this group of youthful engineers.

Work for Largest Organization

Consider the subject of work experiences and business contacts. The assets of the Defense Department are valued at 134 billion dollars. To better visualize these holdings take the combined assets of the nation's one hundred largest industrial corporations — DuPont, Socony Oil, Westinghouse, General Motors, General Electric, etc.—then double their combined value and you would approximate the size of the Defense Department holdings. In terms of experience and contacts this means potentially as representatives of the world's largest organization you will meet and work with personnel from an unlimited number of industrial corporations. In this present age of governmental contracting, no other business has so large a clientele.

The contacts made by the young engineer result in an undesirable attrition of this select group departing the Air Forces for lucrative positions in industry. While not desirable for the Air Force, the fact remains that major corporations do use the military services as their proving grounds. Industry's close working contracts make it inevitable that a keen competition develops and sometimes entices these officers into private industry. Their salaries then are substantially greater than those of their peers who started with industry and received only the usual yearly increase in pay.

Probably the most valuable engineer is one who has completed flight training. Uncle Sam spends $185,000 to prepare this fledgling for flying duties. This experience enhances his worth and broadens his prospective regarding the Air Force technical problems which he will be called upon to solve.

For all engineers the educational opportunities are limitless. The wide range of Air Force career fields, without exception, include the chance for the new officer to request further academic training towards an advanced college degree. Admission into this program brings with it full pay, allowances, all tuitions, fees and books. In other words, full pay with duty pursuing either a Masters or Doctors Degree.

Pay Slightly Lower

What about pay? The February 1958 issue of Nation's Business provides an insight into this important question. The author, Northwestern University's Placement Director, states the engineer might expect an average monthly starting salary of

(Continued on Page 67)

OBLIGATION

ARMY

by Major Colin M. Carter

Many undergraduate engineers are undecided on whether to apply for the advanced ROTC program or wait until they are seniors and choose one of the other programs open for fulfillment of their military obligation. Often we of the Army are asked for advice on this decision. The final decision, however, must be your own, one of the many you must make as you enter the profession of engineering. I can only give you some information as to what you may expect if you choose to try for a commission. What I will tell you is based on the supposition that you are not interested in a career in the service.

Many people are not. It is a demanding profession. This country has traditionally maintained a very small Regular Army which must be greatly expanded in time of war. We must obtain both our soldiers and our leaders from the citizenry then, and will no doubt be required to take in many who are not cut out to be full time soldiers. Not many people realize that the ROTC program between wars gave us enough officers with enough training to get the huge mobilization of World War II off to a good start. We would have been lost without these trained leaders, many of whom provided the vitally needed engineering skills inherent in military operations.

Engineer's Talent Is Recognized

However, the important question to you is how many of these people are young officers on short active duty tours? Or in other words, does the army merely make platoon leaders out of ROTC officers with the beginning engineer losing all contact with his profession?

As a general statement, it does not. However, the amount of engineering that the new officer does, depends to a great extent on the branch of the Army that he goes into, the length of the active duty tour, and the type of unit to which he is assigned. Engineer training is of little immediate use to the Infantry or Armor officer. Artillery uses some engineers in guided missile units, but here also the emphasis is on troop leadership rather than technical ability.

The technical services, on the other hand, usually provide the new officer with a good opportunity to use his engineering education and to use the tools of the engineer, both in equipment and manpower. The competition among the technical services for certain types of engineers is in fact fierce. Corps of Engineers gets most of the architectural and civil engineers but is interested in mechanical, petroleum and electrical engineers also. Signal Corps wants electrical engineers. Ordnance wants mechanical and chemical engineers. Chemical Corps wants chemical engineers. Transportation Corps competes with the Air Force for aeronautical engineers. Quartermaster Corps uses petroleum engineers.

The newly commissioned officers in these technical services are not as a rule actually put into research engineering positions.

One must realize that there are only a small number of officer po-

U.S. Army Photo

Many opportunities are open to ROTC graduates who wish to gain valuable training and experience in the engineering fields. In this picture, student officers are checking and testing receiver components in preparation for future positions either in or out of the service.

sitions in research, development, and industrial procurement agencies; and these are largely executive and supervisory positions requiring officers of some experience in the military as well as engineering aspects of their jobs. Most of the engineering in such organizations is done by civilians, either government employees or on contract. The officer on a two year tour will spend most of his time in service learning and using the techniques of employment of manpower in the attainment of an engineering objective.

But this is supremely important. In any branch of engineering, the man who does not learn early how to direct other men to the completion of a job will not rise far in his profession. We in the Army consider that the newly commissioned officer is still in a learning position so far as handling men is concerned, and time devoted to that task will be time well spent, both for his future value to the service and his success in his profession.

Tour Determines Assignments

The specific type of assignments given to ROTC graduates in the technical services depends on whether they take the six month or the two year active duty tour. Those on the six month tour ordinarily do very little during their time on active duty except attend the basic officer's school of the branch to which assigned. This short period on active duty does not allow assignment to any position in which the officer can get in much effective work before he is released.

Those on the two year tour normally are assigned as platoon leaders or subordinate staff officers in troop units of the branch assigned, either in the United States or overseas. The type of work done by the officer depends on the mission of the unit. There are a large number of assignments available which provide valuable training and experience in engineering tasks. Examples are assignments in Engineer construction and topographic units, Engineer, Ordnance, Transportation, Signal, and Quartermaster maintenance units, Army Security Agency, and Signal Operations and Construction units. A very few graduates are assigned to research engineering positions. Your chances of being assigned to such units are generally pretty fair, but I would hate to try to forecast them accurately since the needs of the service at the time you are commissioned will have a lot to do with your assignment.

The choice between the six month and two year tour depends on your proposed future action as a civilian. Six months is of course a shorter time than two years, and if you are exceptionally eager to settle down in the firm which you have selected, or which has selected you, it has its advantages. Certainly, you will gain more in experience and maturity in the two year tour, but you run a distinct chance of finding yourself two years behind your civilian competitors in the organization. Some firms prefer the man with service experience. A man from a major oil company, recruiting on this campus, told me that his firm would hire an outstanding engineer for a very short period before active duty, just to insure him a job when he got out of service and to protect him from personnel raids by other companies. But to some firms, required military service of their employees is merely a nuisance. If you contemplate employment in an outfit like that, try to get the six month tour.

Pay Is Somewhat Lower

The question of how a second lieutenant's pay compares with the "fabulous" offers engineers get from industry often arises. A married lieutenant with no previous service draws $222.30 base pay, plus allowances of $133.88, for a total of $356.18 per month. Both social security and income taxes are withheld from base pay only. There are certain benefits in addition to pay which must be added to the plus side of the ledger, such as initial uniform allowance, medical care and dental care, and access to post commissaries and exchanges, but the end result naturally cannot match the initial offers presented to outstanding engineer graduates. The competition in industry for such men is still very active.

We started this discussion on the basis that you were not interested in the Regular Army. However, there are many rewarding features to a service career, but not many of them begin to be realized until after your third year of service. Of course, many of these rewards are not financial. A Regular Army officer can usually live comfortably on his salary, but it is traditional that he will never get rich, and he does not have the time or opportunity until after retirement to become a corporation executive, a consultant or independent operator, the three major roads to riches for engineers.

Other Alternatives

There are several alternatives open to the graduating engineer who does not choose to enter the ROTC program. You can always wait for the draft. If you are drafted, your term of active duty will be about the same as that of a Reserve officer and your Reserve commitment is about the same, at a far lower rate of pay and less opportunity to engage in engineer type work.

Or you can enlist in the Reserve or National Guard, for eight years. The Army will send you to active duty for six months to take basic training in that case, at private's pay. Enlistment in the Regular Army is also a possibility, without much to recommend it for the graduate engineer. The alternatives do not appear to be very attractive to me, but people's tastes differ.

There is an Army program which assigns draftees to technical positions so that their education and training can be used. Admittance to this program, however, now requires an M.S. or the equivalent, and we are actually looking for mathematicians and physicists rather than engineers. From a severely practical point of view, while you may be practicing your profession, you are doing it at private's pay with attendant disadvantages. There is also a program of directly commissioning men with certain special skills in the scientific fields. Here we are looking for outstanding men with several years experience as well as educational qualifications, who are interested in the Regular Army exclusively.

Here, then, are the advantages and disadvantages facing the engineer who enters the advanced ROTC program along with the alternatives to the program. The final choice, however, is up to you.

WHY GRADUATE SCHOOL?

by Professor Henry G. Booker

An increasing number of engineers are considering the possibility of further education after receiving their Bachelor's degree. Several questions immediately come to mind concerning graduate school. Prof. Booker attempts to answer these questions.

Q. *What are the functions of graduate education?*

A. The principal function of undergraduate education should be to develop the mind of a student by having him think through things that other people have frequently thought through before. It should be the object of undergraduate education to pursue this process to the point where it is no longer worth the student's while to think through well-known thoughts merely in order to develop his mind. Graduation should signify that the student's mind is about as developed as it can be merely by studying what is well known. By contrast, it should be the object of graduate education to develop the student's mind by having him think through things that have not been completely thought through before so far as the student is aware. Research should thus be the principal tool of graduate education.

There are a number of universities in the world where graduate education is distinguished from undergraduate education by quite a clean-cut change of emphasis from study based on well-known thoughts to study based on novel thinking. But in most American universities this distinction has not been maintained. It has not been possible for the Public Educational System to provide early education suitable for the kind of individual who ultimately enters graduate school, and the universities, in their turn, have been unable to fulfill in four years the objectives of undergraduate education defined above. Graduate students usually spend half of their period at graduate school completing an education which in reality is undergraduate in type before they can devote their minds to novel thinking. Most engineering students, when they enroll in a graduate school, do not even realize that they are supposed to be entering on an educational program based on novel thinking. Their idea is that graduate education is merely a more thorough but more specialized version of undergraduate education.

Photo Science Studios

Professor Henry G. Booker is a professor of electrical engineering at Cornell University. He received his B.A. at Cambridge in '33 and his Ph.D. in '36.

Q. *Who should go to graduate school?*

A. Any student with grades above about 75 or 80 who feels able or is interested in playing a creative part in the life of the country and of the world. Students who satisfy this criteria usually are accepted without difficulty. A certain number of other students are also accepted in hope that their further development will show that they meet the criteria.

Q. *What is the value of a graduate degree?*

A. The value of a graduate degree is largely connected with the competence of the faculty member with whom the student collaborates in his research. Institutions whose faculty members are well known for their contributions to research generally maintain high standards for graduate degrees. Moreover, this fact is generally known to employers and others.

Q. *With Cornell's five year program, is a Master's degree necessary or worthwhile?*

A. Opinions on this differ. Some people would say that Cornell five-year degrees consist of four years

Estimated Starting Salaries of Engineers Holding Various Degrees (June 1958)	
Bachelor In Engineering	$470. (4 yr. school)
Bachelor In Engineering	$490–540 (5 yr. school)
Doctor's In Engineering	$700.

Compiled by Professor J. E. Hedrick

of specialized engineering education plus one year of general education. From the specialized standpoint therefore, the Master's degree is as necessary to the five year Cornell undergraduate program as it is to a four year program. However, in practice, a Cornell five-year degree contains more specialized education than most four-year degrees. Consequently a Master's degree is less necessary in connection with a five-year degree than with a four-year degree. However, the complete difference in concept between a graduate degree and an undergraduate degree, if put faithfully into practice, makes the question almost meaningless.

Q. *Are scholarships available to graduate students?*

A. Yes, there are fellowships and scholarships in ever increasing numbers. There are not, however, nearly enough fellowships and scholarships to cover all graduate students. However, there are plenty of teaching assistantships and research assistantships available. Any graduate student who meets the criteria mentioned in the answer to the second question is assured, in practice, of financial support.

Number of Doctor's Degrees in Engineering by Fields (1956–57)	
aeronautical	32
chemical	146
electrical	130
engineering physics	17
mechanical	67
metallurgical	52
civil	34
all others, (sanitary, ceramic, petroleum, industrial, etc.)	112

Compiled by Professor J. E. Hedrick

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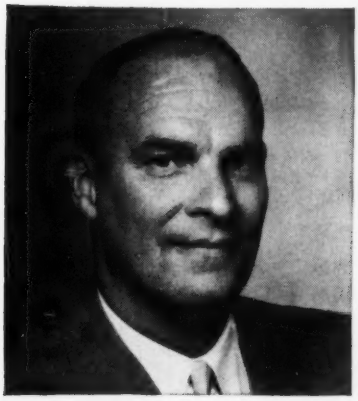
Du Pont personnel representative



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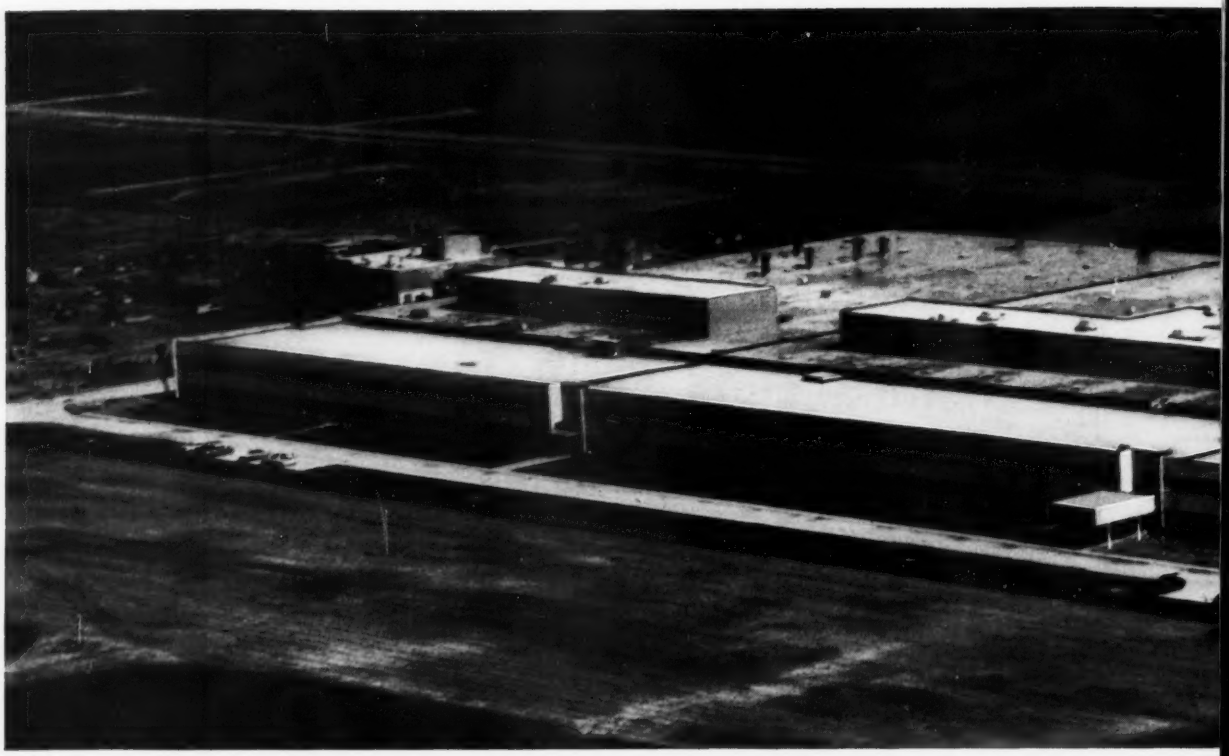

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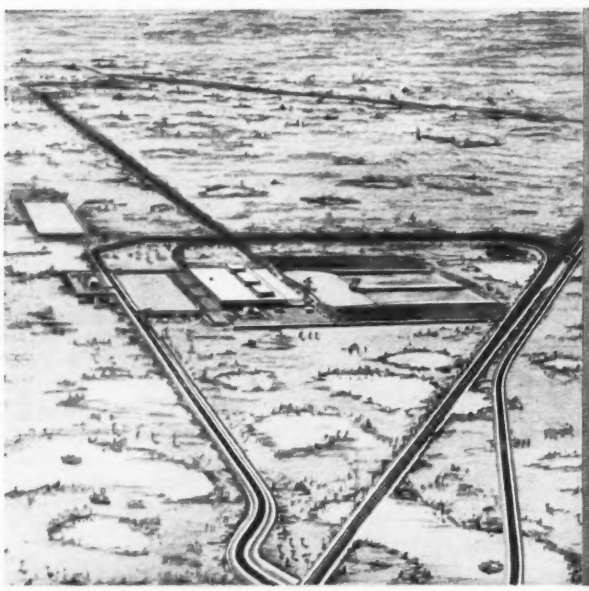

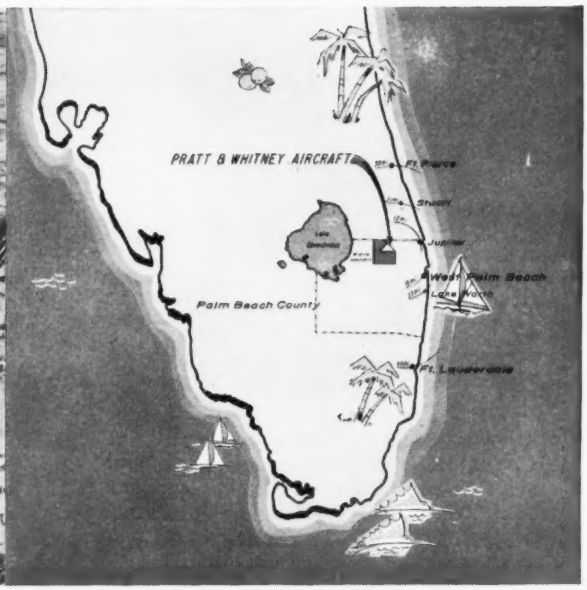

ISOLATION—Ten square miles comprise the site of Pratt & Whitney Aircraft's new Florida Research and Development Center. Experimental shops and offices covering some 17 acres are in the foreground, while the tests areas, barely visible in upper left, lie four miles in the background.

LOCATION—The new Center is located at United, Florida, midway between West Palm Beach and Lake Okeechobee, in the upper Everglades area. It is almost surrounded by a wildlife sanctuary. Most employees live in the cities and towns along the east coast of Florida, driving to the Center on excellent new highways.

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Research at Cornell . . .

EDUCATION AND DISCOVERY THROUGH RADAR RESEARCH

Electronics research at Cornell serves the two fold purpose of providing education and discovery. The electronics projects are directed toward solving radar problems that are of vital importance to the progress of the United States missile program and to other areas of the defense system. They also give graduate students and some undergraduates the opportunity to learn the methods of specialized research.

The research program is conducted in Phillips Hall under the direction of Professor G. Conrad Dalman, Associate Professor H. S. McGaughan, Assistant Professor N. DeClaris, and Assistant Professor L. F. Eastman. It is financed by grants from the Signal Corps in Belmar, New Jersey and the Rome Air Development Center in Rome, New York. The research presently involves sixteen graduate students and five undergraduates.

Most of the research projects are of a basic nature. The increasing demands for more precise electronic equipment have made it harder and harder for the engineer to solve problems by hit or miss experimentation and have made it a necessity for him to learn more about electrons, fields, and their interactions and to work problems out in theory. Thus, although the research grants are for specific purposes they require basic research and involve many different projects.

Eric Gregerson

Professor Nick DeClaris (right) looks on as Graduate Student Mark White measures automatically the gain of a new distributed amplifier which uses UHF triodes in a cascode connection. The new amplifier is capable of amplifying signals from very low frequencies to frequencies as high as 400 megacycles with very little noise output.

The educational part of the program has two phases. The first is the students' thesis project which is of a specific nature and provides training in the methods of research. Most of the projects are of considerable significance and provide a good deal of incentive for the student.

The other part of the program is the weekly seminar which keeps the student up to date with the other fields of electronics and helps to broaden his education. In these seminars the students and professors meet together to listen to guest speakers and to discuss their own problems. Through these meetings the engineering student learns to treat all types of electronic tubes and circuits as interrelated aspects of the same field rather than as different fields. By combining a specific project with a broad education a student becomes prepared to do well in any branch of electronics.

The research has been divided into three sections. The first is physical electronics which involves the make up of materials used in electron tubes and the degree to which impurities can be tolerated. The second section is microwave electronics which deals with the problems peculiar to radar and other microwave devices. The third group, active networks, involves the environment within which electron tubes operate.

Noise Is a Problem in Radar

One of the largest problems that Professor Dalman faces is the interference caused by the internal noise of electron tubes. Weak signals from distant sources are often blocked out by noise generated inside the amplifier itself. Everyone experiences this phenomenon when trying to tune a radio to a station which is too far away to be heard over the noise level of the radio. In order for missiles to be directed accurately to a target, for long range detection systems to work, and for radio-astronomy studies to be made possible, this noise must be suppressed.

In the studies that have been already carried on, noise has been found to be largely related to impurities in the cathode of the tube which cause electrons to be emitted irregularly in groups rather than at a constant rate. Noise thus has been related to the smoothness of the cathode, the shape of the cathode, and the type and purity of the material of which it is made. All of this data has been equated by Professor Eastman in such a way that IBM machines can be used to solve noise problems. Noise has also been found to be related to the circuit in which a tube is operating and special circuits have been worked out to help suppress noise. One of these is a variation of the cascode circuit which is used in modern television sets.

Noise becomes an even greater problem at microwave frequencies, because of the delay between the time a signal passes through an amplifier and the time when the noise is generated. This time interval is negligible compared to normal wave lengths but is sizable when divided by the time interval for a single microwave. Often this delayed noise coincides with the radar echo and either distorts the echo or masks it entirely. Professor McGaughan is presently directing projects aimed at solving this problem.

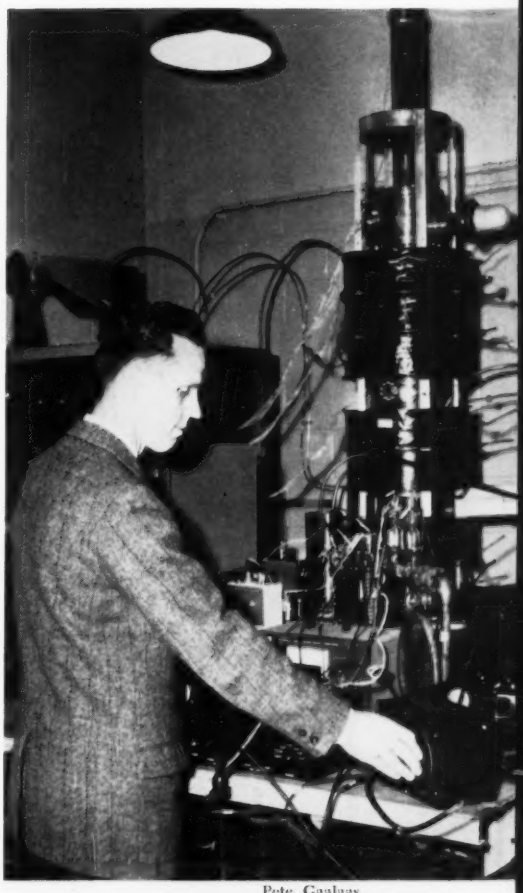
Spurious Outputs Hinder Advances

Another problem which is holding back advances in radar and other microwave equipment is spurious outputs. These are outputs of a specific frequency and can be classified into two different types. The first type are harmonics of the frequency desired which are amplified because of certain size and shape relationships in the tube itself which cause resonance at the harmonic frequency. The second type are tube generated frequencies caused either by the series resonant circuit in the electron gun or by the ionic radiation of the gases inside the tube. Both types can cause breakdowns and interfere with other forms of communication such as radio and television. They also can produce a radar echo that is either too early or too late in time and thus causing a false location to be observed.

The amplification of harmonics has been studied in relation to the size and shape of the tube cavity and theories have been worked out that make it possible for special tubes to be constructed to greatly suppress harmonic outputs. Likewise spurious outputs caused by the resonant circuit in the electron gun have been compensated for by outside circuits which neutralize the effect of the internal resonant circuit.

The ionic-plasma radiation from the gas in the tube will be carefully studied in relation to the type and pressure of the gas with the aid of a special radio frequency mass spectrometer which has been developed at Cornell. The mass spectrometer has an array of grids with AC voltages of variable frequency. These are capable of separating out ions of different charge to mass ratios. With this process gas with a very low pressure can be detected and analyzed.

Another tool used in both microwave research and physical electronics research is an eight foot high electronic tube which is one of the most powerful in the world. The tremendous power and high velocities possible with this tube enable the fundamentals of the electron tube to be more closely studied.



Pete Gaalaas

Professor G. Conrad Dalman makes an adjustment of the eight foot high electronic tube which is used in research at Cornell. The tube is one of the most powerful in the world.

Research in Active Networks

Many of our systems used to detect the presence of enemy planes or ships involve radar scanning devices which pick up enemy radar signals. To be effective, these scanning devices must operate over very wide frequency ranges and have very little noise output. At present, much of the work in the active networks field is directed toward developing better broad band amplifiers for use in detection systems.

The work in the active networks field is of a very general nature and the main emphasis is on learning more about electronic circuits in general and developing new theories to be used to solve problems such as the broad band amplifiers. At present it is relatively easy to synthesize circuits containing only resistance, inductance, and capacitance, but active networks must still be worked out by experimentation. Professor De Claris is, therefore, directing his research toward developing theories that will make it possible for electronic circuits to be synthesized to suit any conditions.

—Alden Speare, Jr., EP '63

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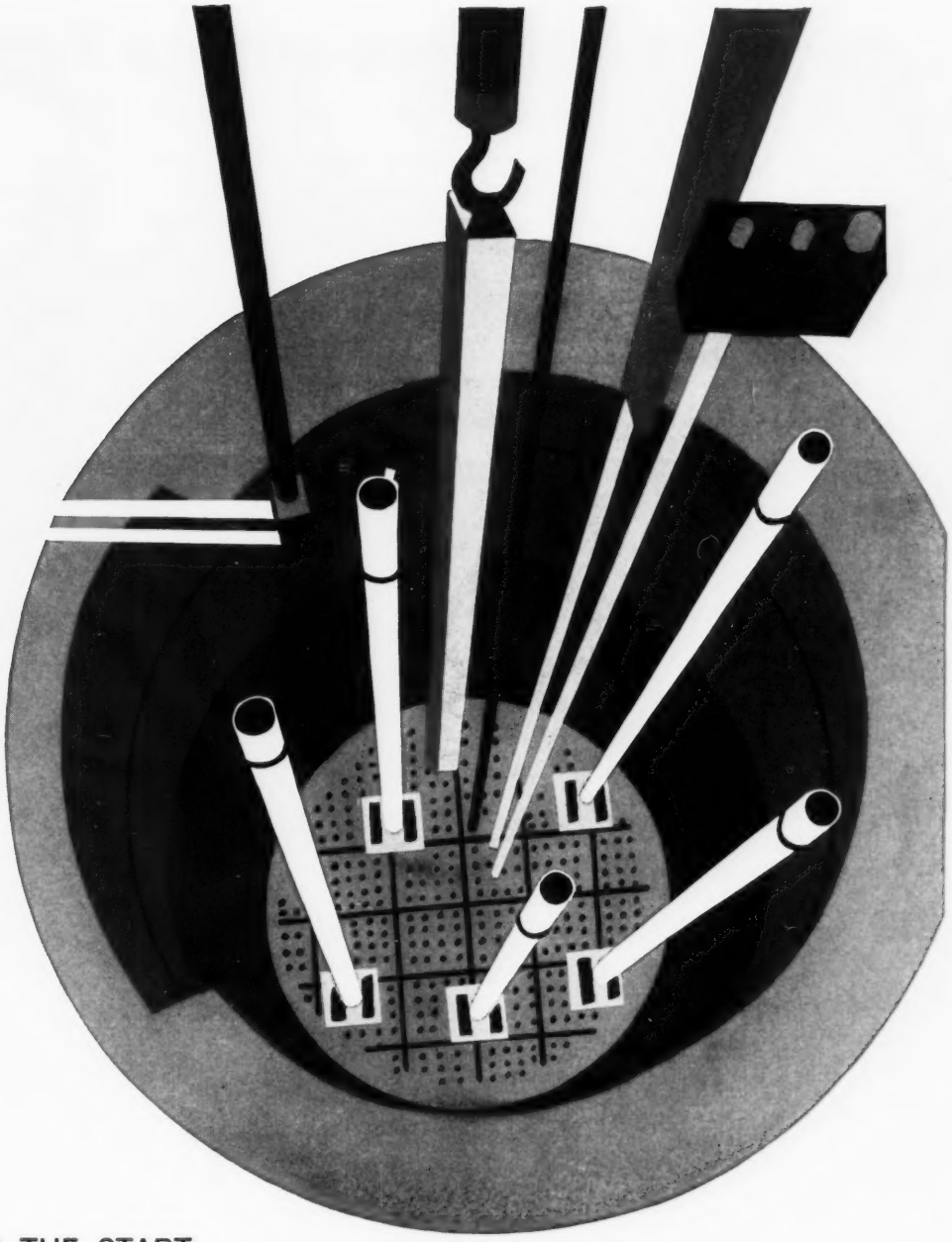

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James E. Beehler (Purdue, MSEE '48), Frank W. Clover (Carnegie Tech, BSEE '47; Harvard, MA '51), Richard E. Disbrow (Lehigh, BSEE '52), plan the AEP System of the future with a network analyzer.

3. New York City—STAFF ENGINEERS
Richard H. Pechstein (RPI, BME '46) and John E. Dolan (Columbia, BSME '50) perform heat balance calculations on new steam cycle.

4. Wheeling, W. Va.—DISTRIBUTION ENGINEERING
Enea Antonucci (West Virginia, AB, BSEE '54) and Robert O. Meador (Tri-State, BSEE '49) supervise installation of underground distribution facilities.

5. New York City—NUCLEAR POWER ENGINEERS
John R. Struyk (Clarkson, BME '51) and Robert S. Hunter (Penn State, BSME '50) discuss design of fuel element.

6. New York City—APPLYING DIGITAL COMPUTERS
Howard K. Amchin (Penn State, BSEE, '46; IIT, MSEE '49) and Glenn Stagg (MIT, BSEE '48; NYU, MBA '56) selected by Eta Kappa Nu as one of three outstanding young engineers in the U. S. in 1958, solve a special problem faced by the AEP System.

7. Roanoke, Virginia — INDUSTRIAL POWER ENGINEER
Robey Jarrett (VPI, BSEE '51) consults with contractor on progress of motel to be heated and cooled electrically.

8. Canton, Ohio—SYSTEM OPERATION ENGINEER
Richard P. Blaes (Dayton, BEE, '51) helps to coordinate load scheduling and exchange of power with other electric utilities.

9. Twin Branch, Indiana—POWER PLANT MAINTENANCE SUPERVISOR
Herbert A. Bissinger (Michigan College of Mining and Technology, BSEE '50) leads briefing session concerning turbine overhaul schedule.

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William A. Black (MIT, SMEE '50) discusses operating problem with the supervisors on his staff.

11. New York City—RESULTS ANALYSIS
Engineering trainee Paul Butler (Purdue, BSME '58) discusses features of recording instrument with steam generation engineer Richard C. Kopelow (Michigan, BSME '51).

12. New Haven, West Virginia—RESULTS ENGINEER
William R. Johnston (Univ. of Cincinnati, BSME '51) analyzes circuit for electronic instruments at a major power plant.

13. Muncie, Indiana—DIVISION METER SUPERVISOR
Jack Stark (Purdue, BSEE '49) examines the demand chart on a metering device for an industrial customer.

14. New York City—HIGH VOLTAGE RESEARCH
Jack M. Miller (Milwaukee, BSEE '57) and Robert H. Schlomann (MIT, SMEE '56) discuss means for reducing radio influence on 345 kv transmission lines.

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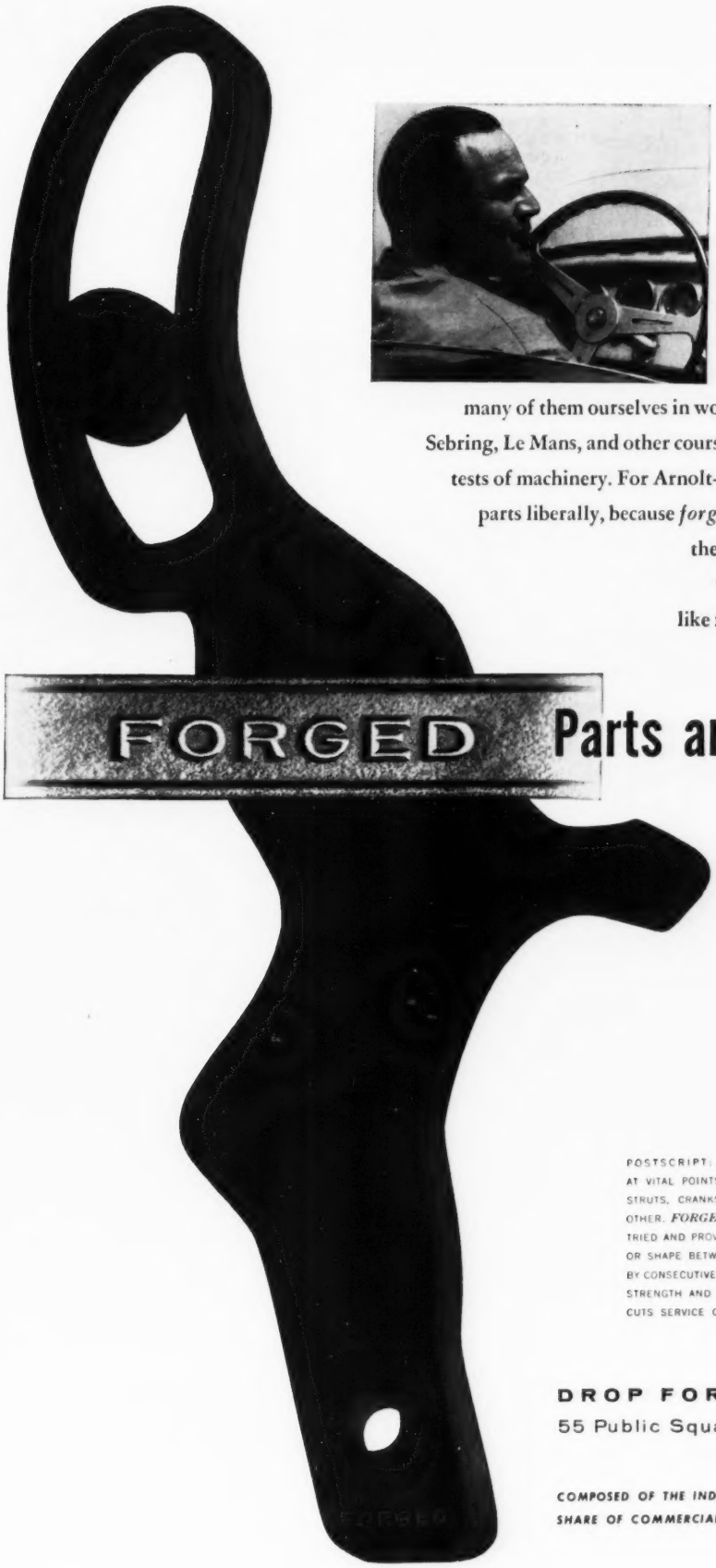

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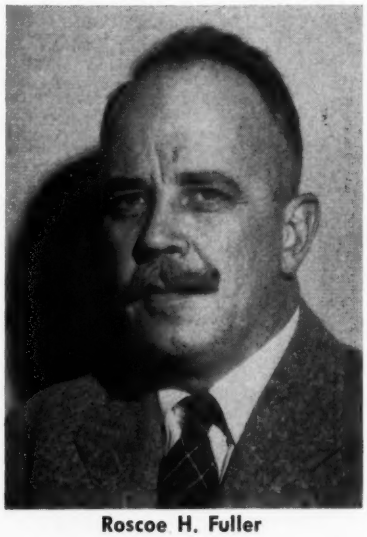

Roscoe H. Fuller

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students, and to establish closer relationship between the College and its alumni."

THE PRESIDENT'S LETTER—

Random Notes from the President's Desk

Hollister Dinner. One of the most interesting current projects of your Society is the testimonial dinner to Dean Hollister, which will be held at the Plaza Hotel in New York on Tuesday, April 14, 1959.

Dean Hollister is retiring this June, following a career of outstanding accomplishment in many fields. Cornell has been honored to have him as its Dean of Engineering, and his impact on the Engineering College and on the University generally will long be felt. His successes in instituting the five-year program, in establishing the new engineering quadrangle and in enhancing the reputation of Cornell engineering are known throughout the world.

Formal announcement of the dinner will be made shortly. All Cornellians, their ladies and guests are cordially invited. If, due to your distance from New York, no formal invitation is received, be assured that no slight is intended. Your presence is no less urgently desired, and it is hoped that you will find it possible to attend.

Cornell Engineer. Those of you who see other engineering college magazines will realize the excellence of this one, and will have no difficulty in realizing the justice of the awards it has received in national competition. In addition to its wide circulation among alumni and students, it is found in the libraries of secondary schools through the country, and we have reason to believe it is a factor in influencing sincere and gifted students to enter Cornell.

To further broaden its interest to readers, the editors earnestly solicit articles by alumni on subjects of general engineering interest, as well as notes on the doings and accomplishments of alumni. Don't be modest about your offerings; they will be welcome. The Society will be glad to forward articles if you prefer not to send them direct. Advertising in the pages of the Engineer is another means of supporting it, and as you will see from the current issue, your firm will be in good company.

Comment. A recent letter of mine "In Praise of Individuality" has provoked more favorable comment than anything I have hitherto written in this space. To those who have been kind enough to write, my thanks. It is gratifying to know that this column is read, and even more so to realize that my feelings on the subject are shared by so many of my fellows.

Several of my correspondents have pointed with pride (justifiably, I think) to the tradition of freedom with responsibility traditional at Cornell, although some have expressed concern that that freedom is diminishing. Let us hope that it is not so; that future administrations, like past ones, will realize the importance of fostering such a tradition. Its value to our University and to our Country far transcends the illusory values of security and conformity.

If you have a concern regarding any aspect of University policy or affairs, let your voice be heard. Your suggestions to the Society will be given careful consideration, and their import passed on to the appropriate office in Ithaca.

Reserve April 14 now for the Hollister dinner.

—Roscoe H. Fuller.

ALUMNI ENGINEERS

Maj. Gen. David H. Tulley, C.E. '28, of Durango, Colo., was recently appointed Commanding General, U.S. Army, Japan, with headquarters at Camp Zama, Japan.

Gen. Tulley a graduate of the United States Military Academy with a commission as Second Lieutenant of Engineers, later attended Cornell and was awarded civil engineer's degree.

At various times in his career, he has served as instructor for the department of civil and military engineering, at the U.S. Military Academy; Chief, Control Branch, with the Office of Engineers in Washington, D.C.; Assistant Engineer, Third U.S. Army in the European Theater of Operations during World War II. He has occupied several important post-war engineering posts.

In May of 1956, he became Commanding General of Fort Belvoir, Virginia, the home of the Engineer branch of the U.S. Army. His command included The Engineer Research and Development Laboratory.

Charles B. Palen, M.E. '13, has been engaged since 1955 in design and machinery arrangements for a nuclear power plant for a "Large Ship." The work is being done at the National Reactor Test Facility located in Idaho. Mr. Palen is vice-president in charge of operations in Idaho of the Eastern Idaho Construction Co., Inc., a subsidiary of Newport News Shipbuilding and Dry Dock Co. Joining the parent company upon graduation in 1913, he took charge of the machinery installation division in 1933. Among Mr. Palen's previous projects is the U.S. Plane Carrier Forrestal which was completed in 1955.

Robert C. Gorham, E.E. '24, of Pittsburgh, Pa., was awarded the Distinguished Service Certificate of the National Council of State Boards of Engineering Examiners, at the Council's annual meeting on August 22, 1958. The Council's board of directors adopted a resolution complimenting Professor Gorham's outstanding work for the N.C.S.B.E.E., and for the engineering profession.

Edgar F. Wendt, M.E. '11, recently retired as president of Buffalo Forge Co. Starting with the company after graduation, Mr. Wendt became president in 1929. Mr. Wendt is an active member of the Cornell University Council, the American Society of Heating and Air Conditioning Engineers, the American Society of Mechanical Engineers, and is a past-president of the National Association of Fan Manufacturers.

William Crawford, Jr., C.E. '20, announced his forthcoming retirement upon completion of his present assignment as civilian chief, engineering division on the design and construction of the new Air Force Academy in Colorado Springs, Colorado.

Edwin Krieg, M.E. '22, vice-president and consulting engineer of Stone & Webster, was the opening speaker at a national power conference last fall in Boston, sponsored jointly by ASME and AIEE. Mr. Krieg's paper, "A Look at the Future in Power Station Design," told of the fantastic forecasts in power needs and power plant design twenty to forty years hence.

George L. Mueller, Jr., Ch.E. '57, has been promoted to assistant chemical engineer in Technical Division at Humble Oil & Refining Company's Baytown, Texas, refinery. In the Catalytic Light Ends Section he is handling technical problems associated with the recovery and utilization of the light hydrocarbon components produced in catalytic cracking operations. A large part of his effort is directed toward solving problems encountered at the ethylene recovery unit.

William G. Christy, M.E. '11, was elected an honorary member of the Air Pollution Control Association at its fiftieth annual meeting. There are only nine honorary members out of 1600. He was president of APGA in 1949–50. Not long ago he was awarded the Man and Boy Award of the Boys Clubs of America. It was given for meritorious service as a member of the board of directors of the Jersey City Boys Club for twenty-five years and president of the board since 1944.

(Continued on Page 68)

U.S. Army Photo

Maj. Gen. David H. Tulley, new commanding general, USARJ, receives congratulations from Lt. Gen. E. L. Cummings (center) and Lt. Gen. Robert W. Burns, commanding general U.S. Forces, Japan.

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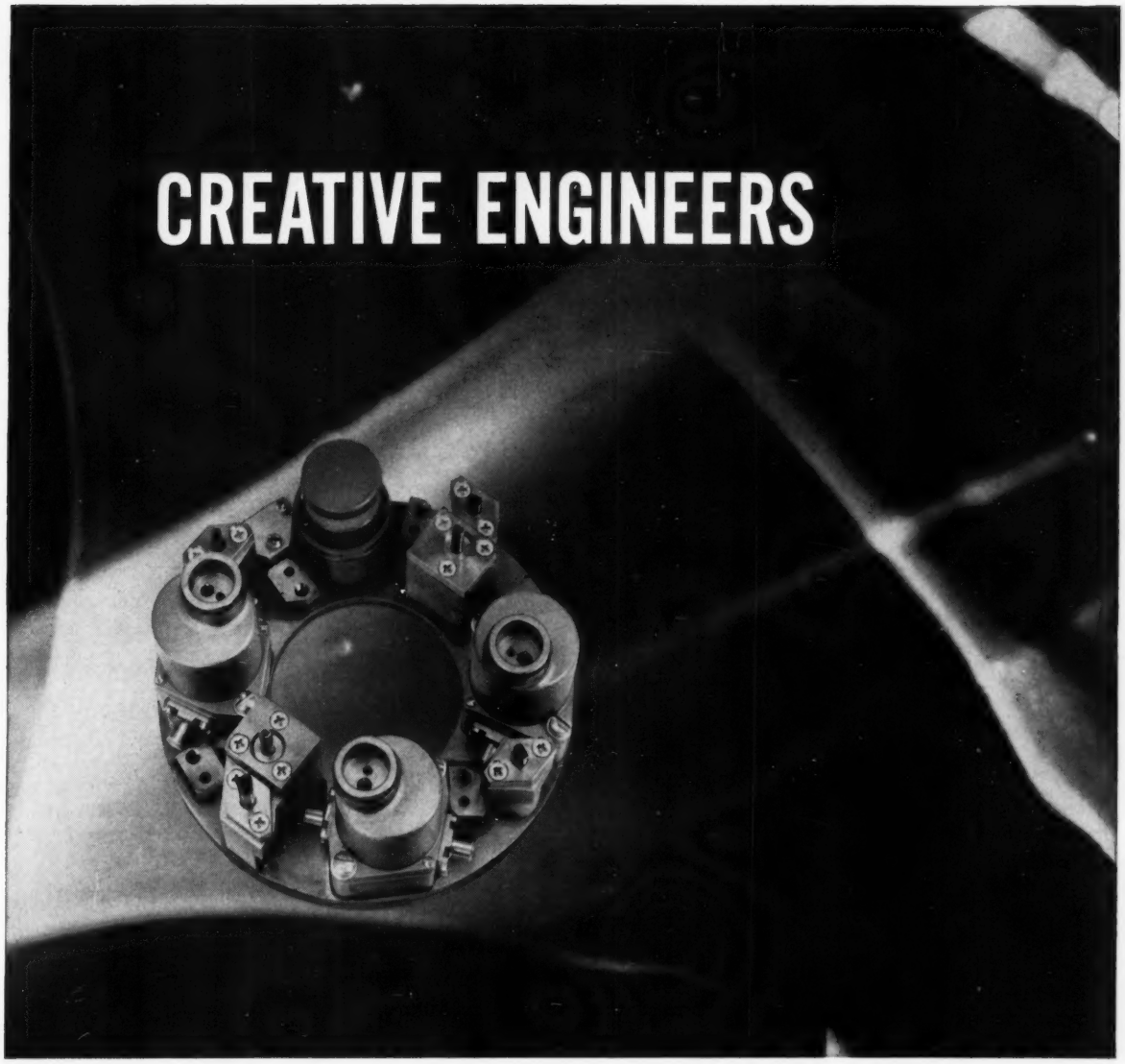

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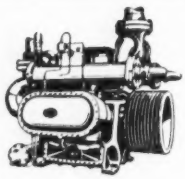

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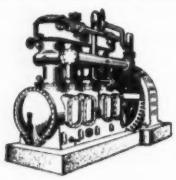

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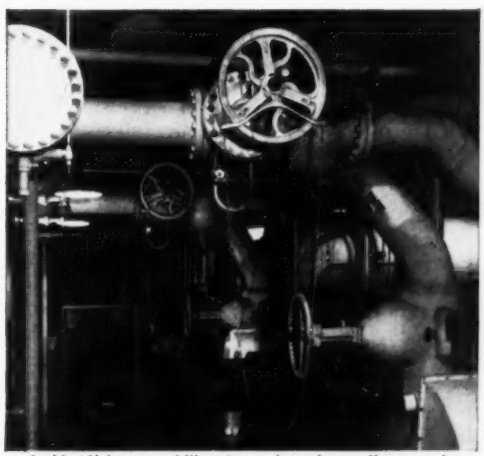

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COLLEGE NEWS

Edited by J. L. Schoenthaler, ME '61

EE SCHOOL UNDERTAKES NEW RESEARCH PROGRAM

Cornell University scientists studying bursts of radio energy from the sun may uncover accurate ways of forecasting the magnetic storms which temporarily blot out radio communication.

The basic research project, which is being supported by a recently-awarded National Science Foundation grant of $29,500, may also lead to new insights into the weather.

Under the direction of Assistant Professor Marshall H. Cohen of the School of Electrical Engineering, Cornell's researchers will use some of the world's most sensitive equipment to study radio energy that falls within the meter wavelength part of the spectrum. The sun emits radio energy continuously, but some of this comes in the form of bursts which yield signals as much as one million times as powerful as the ordinary background noise. These energy bursts are accompanied by particles from the sun which cause blackouts in radio communication.

Professor Cohen says when scientists learn more about the sun and its relationship to these energy bursts, they may be able to foretell the magnetic storms which sometimes severely interfere with radio communications. When these storms are in progress, radio communications may blot out completely or, in a few cases, may even go to the wrong destination. This is especially true in the far north. In Arctic and sub-Arctic Sweden, for example, hand signals replace electric signals on railroads during magnetic storms. Men carrying flags transmit control signals outdoors. If the energy bursts could be reliably predicted, communication in Sweden and Alaska would be greatly facilitated, many scientists believe.

One of the most important aspects of the research project will be the study of polarization, or the variations in the properties of the energy according to its orientation in space. Differences in polarization are responsible for television antennas being horizontal in the United States and vertical in England, where transmitting processes differ from those in this country.

To study polarization, scientists use a device called a polarimeter. Cornell's polarimeter operates on a narrower band width than any other such detector on earth, giving it a better chance of observing polarization.

The Cornell scientists hope to assemble enough equipment to learn all the characteristics of sunbursts at one or two frequencies in the meter wavelength band.

SPACE LAWS DISCUSSED BY CORNELL LAW EXPERT

Man's approach to the brink of outer space has brought him to a new legal frontier, a Cornell University law professor said Sunday night.

Speaking before the Cornell Graduate Supper Club, Prof. Rudolf B. Schlesinger discussed legal problems in outer space which will arise when man makes his first voyage to the moon. Some of these problems, he said, are already in evidence.

Professor Schlesinger, whose specialty is International and Comparative Law, said many problems of space law will center around the complete lack of physical boundaries in space. "There are no mountain ranges, rivers, or oceans to break empty space up into clearly defined areas," he said. "If one nation photographs another from a platform 1,000 miles above the earth, is that nation violating any international law? What sorts of laws could be established to control espionage work of this kind? These problems aren't as far in the future as they once seemed," Professor Schlesinger declared.

The Cornell law expert said it might not be possible for space travelers to live according to the laws of their own nations. "Suppose 100,000 Americans and Russians were living together on the moon or nearby planets. If each tried to obey only the laws of his own nation, there would be quite a bit of conflict," the professor averred.

"Many of the legal problems of outer space are on the border between law and physics," he stated. "For example, where does air space end and outer space begin?" He said many other questions center around sovereignty. "Is there any sovereignty at all in outer space? Who owns the moon? What laws will prevail on the moon, if any? Can any government shoot down any rockets it chooses? If a rocket falls to earth and does extensive damage, who pays for it?"

Professor Schlesinger said current U.N. attempts to set up a committee on space problems may eventually yield tentative answers to some, if not all, of these questions. "The very fact that the United Nations is working on such a committee compels us to take definite stands regarding many of these problems, even though some of them may not become acute for many years," he concluded.

UNDERGROUND EXPLOSIVES STUDIED FOR MANY USES

A new way of studying waves from underground atomic explosions has been found by Professor J. W. Dally of the Mechanics and Materials Department.

To find out what happens when impulses from a powerful blast travel through the earth, Professor Dally has sent waves from a fast-burning explosive pulsing through urethane rubber. The soft material slows the waves down so they can be photographed by a semi-high speed camera and studied in detail. The waves travel through the 12-inch-square rubber model in about 1/300 of a second. All pictures must be taken in this time.

Professor Dally presented his findings at the annual meeting of the Society for Experimental Stress Analysis in Albany, N.Y.

Underground explosions have been suggested as a possible way the Russians might try to beat an atomic inspection program. The success of such an attempt would hinge on the underground waves not being detected.

Underground explosions are also being considered as a way of tapping shale oil, producing harbors, mining deeply buried ore veins, creating underground reservoirs, and taking the salt out of ocean water.

NOBEL PRIZE WINNER ADDRESSES STUDENTS

"Science and National Policy" was the topic presented by Dr. Isidor I. Rabi when he addressed students in Bailey Hall on December 10.

Rabi, a graduate of Cornell in 1919, stressed the important role of science in national affairs. He pointed out that the future will be determined mainly by the present advancement in the technological fields.

To create a more effective program, Rabi suggested a re-evaluation of the existing governmental facilities and the establishment of a Department of Science in the United States Cabinet. Such a department would focus attention on the problem and insure faster decisions, better organization, and make financial support independent of the military budget.

"More capable men in key positions" was also urged by Dr. Rabi. He said that currently the higher agencies in the government were lacking the necessary technical background to make sound decisions.

At a panel discussion held the following afternoon, Rabi expressed the opinion that education is the answer to success in scientific leadership and progress. He added that "many valuable things" would have to be sacrificed to clear the way for science.

CORNELL BECOMES MEMBER OF NEW RESEARCH CORPORATION

Professor Benjamin Nichols, of the School of Electrical Engineering, will be Cornell's scientific representative to the recently formed University Corporation for Atmospheric Research. The corporation, which is part of an expanded national atmospheric research program, will concern itself with a thorough investigation of the earth's atmosphere, from the surface of the earth to the outer reaches of the Ionosphere.

The corporation is composed of fourteen member universities each having two representatives; one scientific and one administrative. Dr. Theodore P. Wright, Vice President for Research at Cornell, will be the University's administrative representative. Except for Cornell the other universities include all those offering graduate work in meteorology. The School of Electrical Engineering at Cornell has been actively engaged in theoretical and experimental studies of the outer atmosphere and solar-terrestrial relationships under Professors R. Bolgiano, H. G. Booker, M. H. Cohen, W. E. Gordon and B. Nichols.

In a recent report the Committee of Meteorology of the National Academy of Sciences revealed that the present amount of atmospheric research being carried on is "pitifully small." In an effort to meet the demand for increased atmospheric research, the corporation will operate a National Institute for Atmospheric Research. This institute, which will be supported by the National Science Foundation, will have the necessary scientific staff and facilities to enable it to deal with large-scale atmospheric problems that no one university could undertake. It is estimated that it will take fifty million dollars and five years for the National Institute to reach its full operating status.

The specific research programs that the institute should pursue are being discussed by panels of experts in all the major fields of atmospheric research. One program will undoubtedly be directed toward understanding the large-scale dynamics of the upper atmosphere and of its coupling with the lower atmosphere. Data for this understanding will be provided by rockets, higher-altitude balloons, and observations on meteors, the airglow, auroras and variations in the earth's magnetic field. The development of an adequate theory of the large-scale circulation of the atmosphere is also required. Satellite observations and the use of an electronic computer of greater speed and storage capacity than any currently available will be used in this program.

The goal of the National Institute for Atmospheric Research will be the scholarly investigation of the large, fundamental problems of the atmosphere. Progress towards future mastery of the atmosphere and "weather controls" depends on getting the basic information which will be obtained from this basic research.

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'60: Marc Fishzohn, Jeffrey I. Frey, Carl B. Loutzenheiser.

PROFESSORS RECEIVE GRANT FOR COMPLEX VARIABLE STUDY

Five members of Cornell's mathematics department are the recipients of a National Science Foundation research grant for twenty-five thousand dollars. The five people who are involved, Professors Fuchs, Herz, Schreiber, Widom, and one graduate assistant, are all working on a separate aspect of analysis with special emphasis upon complex variable methods. All had previously given individual attention to the problems upon which they are applying the grant.

The grant specifically covers the two summers of 1958 and 1959. The stipend of the grant is being used directly to pay the salaries of the participants and to help cover the expenses of the University during the summers concerned. The indirect effects of the grant are to stimulate interest in research, to

(Continued on Page 68)

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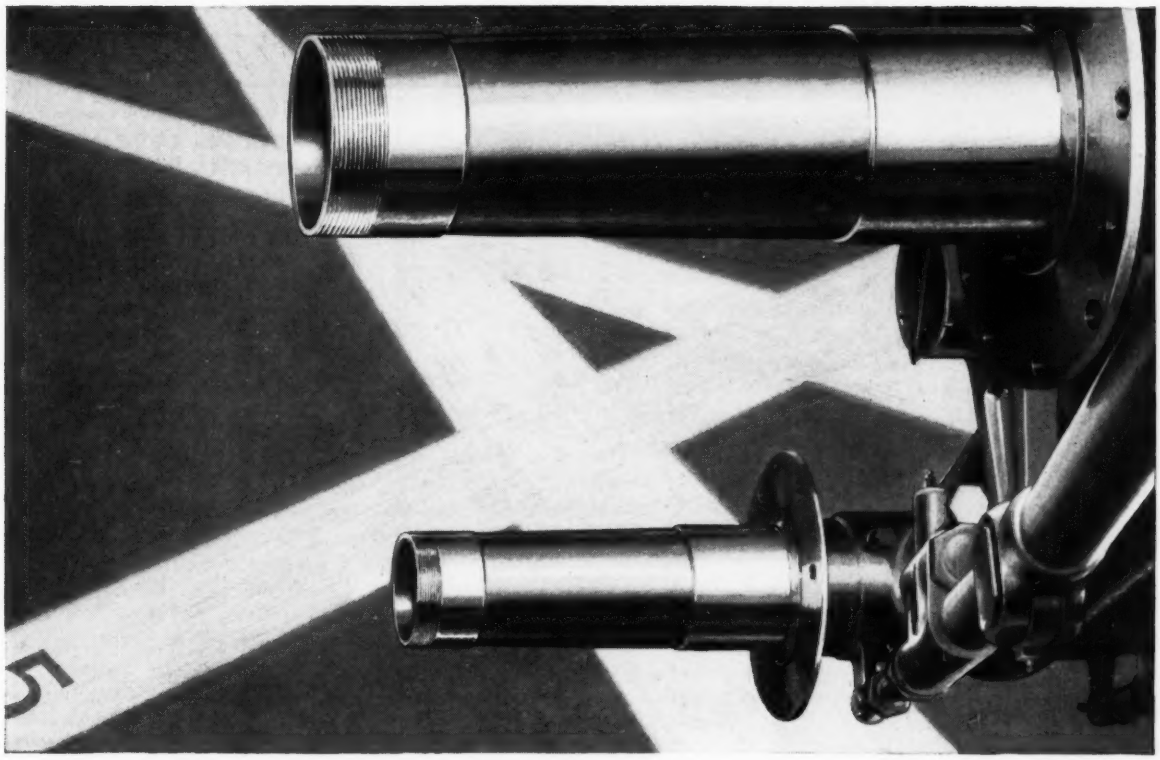

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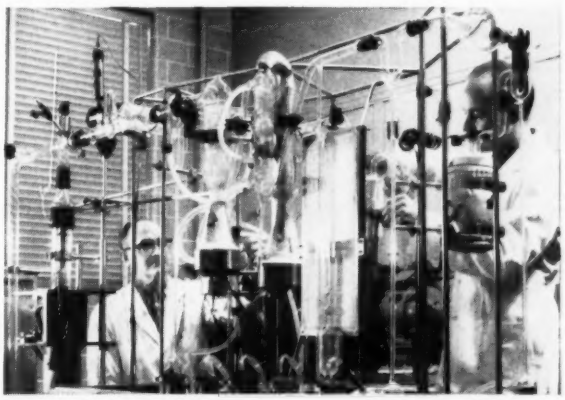

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TECHNIBRIEFS

Edited by R. A. Wolf, EP '62

PLANS CREATED FOR FUTURE MOON BUILDING

Plans for a permanent "moon building" to house laboratories for scientific research, stations for earth-moon communications, maintenance shops for space vehicles, and living quarters for moon explorers have been announced by the Wonder Building Corporation of America.

Because of the present lack of knowledge of the moon's surface, the moon building has been designed to meet the worst possible conditions. If the moon's surface consists of nothing but a sea of dust, the building is designed so that it could float on the dust, anchored by heavy weights. If the moon's surface proves to be sufficiently solid, it could then provide normal support for the building.

Including air lock and plastic observation bubble, the moon building would be 520 feet long, 160 feet wide, and 65 feet high. Above and separated from the roof of the building is a slightly curved umbrella-shaped protective meteoric shield, designed to ward off the rain of interplanetary meteoric dust which descends with great velocity on the surface of the moon.

Entrance to the moon building would be through an air-lock at one end, adjacent to which would be constructed a rocket landing area. Complete internal pressurization of the hermetically-sealed building would provide an air pressure of at least ten pounds per square inch, the same as the pressure used in most high altitude airliners.

Special refrigerating and heating plants would cope with the extreme temperatures and tremendous temperature gradients which abound on the moon. Day and night on the moon are about two weeks long, with temperatures at lunar midday reaching 214 degrees Fahrenheit, at sunset, 32 degrees Fahrenheit, and at midnight, —243 degrees Fahrenheit.

There are no windows in the moon building since ultraviolet radiation, normally absorbed by the earth's atmosphere, would be sufficiently intense to render panes of glass or plastic useless through discoloration. Metal shutters protect the plastic observation bubbles.

Pre-engineered aluminum sheets would be assembled to form the shell and protective barrier. The building would be fabricated completely of aluminum alloys which combine high strength with ease of fabrication. Aluminum would also provide a good reflecting surface which would aid in cooling the building.

Wonder Building Co.

This scale model of the proposed moon building was recently unveiled to military and government officials. The large metal shield protects the cigar-shaped building from the storms of meteoric dust which descend to the surface of the moon with great speed.

NON-ROTATING RADAR ANTENNA PROVIDES INTENSE BEAM

A new radar antenna which may be the forerunner of antennae for powerful, long-range antimissile radars of the future has been announced by the Westinghouse Electric Corporation. The new antenna, known as the Helisphere, scans the sky throughout a complete circle without any motion of the antenna structure itself. In contrast, a conventional radar antenna must rotate continually to scan a full circle. In addition, the Helisphere antenna is extremely effective in concentrating high-frequency radar waves into an intense, narrow, moving beam.

Operation of the Helisphere depends on the fact that radar waves can be polarized or made to vibrate back and forth in a single plane. Polarized radio waves are sprayed through a hollow tube against the inside surface of a sphere in such a way that they vibrate parallel to thin conducting strips wound in a helical design on the sphere. When so oriented, the surface acts somewhat like a spherical mirror and focuses the waves back toward the other side of the sphere.

Because of the nature of the helix, the strips on the opposite side of the sphere lie at right angles to, rather than parallel to, the plane in which the radar waves are vibrating. The waves can then pass through these strips without reflection and continue on into space as a narrow radar beam. Rotation of the hollow tube rotates the resulting radar beam around in a complete circle.

Westinghouse scientists have constructed an experimental model of the antenna made of cloth with metal threads through it in a helical design. The model is about six feet in diameter and operates on radar wave lengths of about one inch. A full-sized antenna would be about one hundred feet in diameter and operate on wavelengths of about one foot.

According to Westinghouse scientists, the new antenna has important advantages over conventional systems. The non-rotating design

allows faster scanning and no power is required to turn it. The problem of rotating bearings is also eliminated. It is believed that the Helisphere's design will work as well in large sizes as it does in small. If it does, it will represent a significant advance in radar technology.

ARMY WEATHER RADAR SYSTEM TRACES NUCLEAR CLOUDS

An effective method for spotting and tracking nuclear clouds by means of radar was recently discovered by the Army Signal Corps. Tests indicate that the Army's advanced weather radar systems, ordinarily used to detect storms and aid in forecasting, may also help to warn soldiers and civilians of probable areas of radioactive fallout after a nuclear explosion.

The special advantage of this radar method of sensing radioactive clouds is that it works in darkness and other periods of low visibility when visual and aerial techniques for measuring nuclear clouds cannot be used.

During recent nuclear tests, the radar equipment measured the size and plotted the course of the "hot clouds" produced. Successive photographs of a radarscope showed the nuclear mushroom and the formation, size, and drift of the characteristic cloud. The clouds were tracked for as long as two hours.

Information on the height and drift of the clouds would be very valuable for providing fallout information to troops on the battlefields. Civil Defense authorities could predict fallout areas and determine which areas should be evacuated and which would be safe for receiving evacuees.

ACOUSTIC SHAKING OF ATOMS REVEALS NUCLEAR STRUCTURE

Westinghouse Research Laboratory scientists have discovered a new method of probing into crystalline structures by vibrating the atoms back and forth up to twenty million times a second.

For more than a decade the nuclear magnetic resonance technique has been used to study molecular structures, chemical processes, crystal structures, and other properties of matter. The method consists of placing a crystal in a steady magnetic field so that the tiny atomic magnets in the structure line up with the field. Another magnetic field, this one varying with time and perpendicular to the steady one, is adjusted until its frequency just equals that of the vibration of the tiny nuclear magnets. When so adjusted, the nuclear magnets absorb energy. This action produces electric signals which yield information on the nature of the structure being studied.

However, the nuclear magnetic resonance technique does not work on metals or semiconductors because these substances act as shields against magnetic fields.

The new technique developed by Westinghouse, however, avoids this difficulty. An acoustic vibration is applied to the atoms instead of a pulsating magnetic field so that the molecules are vibrated mechanically. This vibration causes electric and magnetic fields inside the structure which resemble those which a pulsating field would produce. If the acoustic vibration is adjusted so that its frequency is the same as that of the magnetic vibrators, the system behaves as it would under a magnetic field except that the acoustic vibration is mechanical and the internal magnetic field produced is not hindered by shielding effects of semiconductors or metals. Thus, this new technique should prove a useful tool for the investigation of the structures of conducting materials.

Westinghouse

This functional scale model illustrates with a light beam the working principle of the world's most modern radar antenna. Called a Helisphere, the new antenna also has been made into a six-foot inflated model and eventually will be scaled up to hundred-foot models to be used in the antimissile systems of the future.

INFRARED DEVICE PHOTOGRAPHS IN COMPLETE DARKNESS

A photographic device which uses the infrared radiation emitted by its subject has been developed under the sponsorship of the U. S. Army as a night vision aid.

Called the "Thermograph," the infrared device, unlike a conventional camera, does not require sunlight or artificial light to produce an image. It depends solely on radiation from the person or object at which it is focused. This radiation is dependent only upon the temperature of the radiating body and not on reflected light. The Thermograph can therefore operate in total darkness.

The Thermograph was developed by the Barnes Engineering Company as a research instrument to determine the basic characteristics a military thermal imaging device should have. Such thermal imaging devices are expected to provide a means for night reconnaissance, terrain mapping, target location, and camouflage detection. Commercially, they have already

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found some application in detecting hot spots in inaccessible areas of machinery. Some types of breast cancer have been detected using infrared thermal imaging.

In operation, the infrared radiation is collected by a scanning optical system and focused on an infrared detector. The electrical signals caused by the radiation on the detector is compared to a preset reference level. The deviations above the reference level are amplified and modulate the output of a glow tube which forms a thermal image of the scene on photographic film in a Polaroid Land camera.

SUPER-REFRACTORIES FIND NEW USES IN INDUSTRY

One of mankind's earliest building materials, brick made from clay, has been modernized and streamlined to handle some of the toughest jobs in modern industry, according to the Carborundum Company. Bricks, not of natural clay, but of man-made minerals such as silicon carbide, aluminum oxide, and mullite, are resisting acids in industrial plants, withstanding the pounding of 2800 tons of coke each day, and taking on other chores too rough even for the best metal alloys.

Many of the super-refractories were originally developed to serve as heat resistant linings in blast furnaces and similar hot spots. Now, however, new uses are being found. One group of these super-refractories, for instance, can be melted in an electric furnace and poured into a mold of the desired shape in the same way that molten metals are cast. This process permits the manufacture of such items as pipe, rollers, pump covers, and other shapes.

In one typical application, silicon carbide rollers are submerged in a bath of molten aluminum to hold down strands of wire being pulled through the bath. Cast iron rollers dissolved and contaminated the aluminum within a matter of a few hours, while silicon carbide rolls last three to six weeks.

Super refractories are also used in rocket nozzles where they are exposed to sudden changes of temperature and corrosive gases.

NICKEL-CONTAINING PIGMENT MAKES DURABLE NEW PAINT

The problem of developing a yellow paint that would retain its yellowness through years of outdoor exposure has long perplexed the paint industry. Yellow paints are especially susceptible to the ravages of sunlight, heat, moisture, and corrosive atmospheres.

The Harshaw Chemical Company has recently developed two nickel-containing pigments to make yellow paints which retain their color even in temperatures of over 1,000 degrees Fahrenheit. Combining outstanding light fastness with alkali and heat-resistance, they are also impervious to acids.

These new pigments are direct descendants of the titanium dioxide pigments with locked-in chemical colors developed after World War II. Preceding this development, titanium dioxide had become the most widely used white pigment on the market due to its good hiding properties. Combinations of metallic oxides and titanium dioxide were found to produce color-tinted varieties of this popular pigment. In the case of the new yellow paints, nickel oxide is added as the coloring agent. It also contributes to the pigment's high durability and chemical resistance. The new paints are not susceptible to pigment separation which mixed pigments often display.

The largest market for the new nickel-base pigments is in house paints and masonry finishes. They will also be widely used to give aluminum sidings protection against sun, salt air, acids and other corrosive elements, as well as in finishes for automobiles and household appliances.

SUPERCONDUCTING URANIUM COMPOUNDS DISCOVERED

Uranium, the nuclear fuel that made possible large-scale useful atomic power, has yielded a new family of chemical compounds, among the most unique in science. The new uranium compounds belong to a group of substances called superconductors, materials characterized by the remarkable ability of permitting an electric current, once started in them, to flow in undiminished strength forever.

Superconductivity occurs in various metals and alloys at very low temperatures. As the temperature of a superconductor is lowered near absolute zero, the electrical resistance suddenly drops to about one-trillionth its normal value. Electric currents can then flow in the materials undiminished and practically forever.

Obviously, if this behavior could be made to occur at reasonably high temperatures, superconductors could revolutionize present-day electric and electronic devices. They are just beginning to find applications in midget computers used for airborne control of rockets and missiles.

Measurements of electrical resistance were made on uranium-molybdenum and uranium-niobium alloys that had been stabilized in crystal structure by heating to 1650 degrees Fahrenheit for twenty-four hours and rapidly quenching in water. The alloys showed surprising temperature-resistance behavior. Contrary to all known alloys, their electrical resistance became progressively higher as the temperature was decreased all the way down to 1 or 2 degrees above absolute zero, at which temperature they became superconductors. The superconductivity was especially surprising in view of the rise in electrical resistance preceding it. Correlation of the superconducting and resistivity data has thrown new light on the electronic structure of the atoms making up the alloys.

Westinghouse scientists then studied a group of "intermetallic compounds of uranium. Such compounds are formed when uranium is combined chemically with such metals as aluminum, manganese, iron, cobalt, and nickel. Among the intermetallic compounds containing cobalt, manganese, and iron, four undiscovered superconductors were found. Two of them are the first superconducting compounds ever known to contain manganese and iron. Previously, the presence of either of these two elements had been considered alien to the superconducting state, but that theory has been proven false by these experiments.

These newly discovered superconductors are expected to prove extremely useful in future superconductor research.

Westinghouse-proposed solar sail may permit 60,000 mph speeds in space... and it will need no fuel at all!

Lunar reconnaissance—and manned lunar colonies—may become realities in the not-too-distant future.

But the exploration of deep space is entirely another matter. Distances are tremendous—fuel requirements for chemical rockets are staggering—navigation must be almost unbelievably precise.

As a partial answer to these problems, a Westinghouse scientist has proposed the use of a solar sail which will harness the light of the sun. This sail will require no fuel, it will be capable of fantastic speeds, and its design will permit in-flight navigational corrections. More important, this Westinghouse approach could be cheaper and simpler than any other system proposed for this same purpose.

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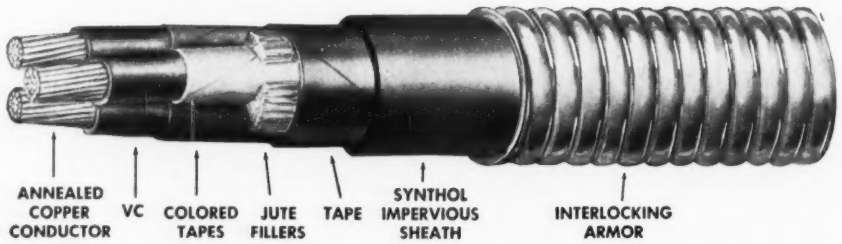

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UNIVERSITY RESOURCES

(Continued from Page 17)

warning that too much stress can be placed on the importance of finding "the right job." After all, each controls his own destiny to some extent, and the future is probably more dependent on what an engineer contributes to his employer rather than what an employer has to offer.

Libraries Have Much Information

In concluding this outline of facilities available for help in finding the right job, I would like to slip in one more bit of cracker barrel advice. Don't forget that libraries are the best source of information on most subjects. Most students aren't aware of this; otherwise many Cornell employees would be out of a job. The Carpenter Hall Library has technical publications and directories which can serve as a guide to employers in special work areas. The National Academy of Sciences Publication 379, *Industrial Research Laboratories Of The United States*, has a subject index to research activities which ranges from Abrasives to Zirconium and includes such things as Organsols and Phytotoxicity.

The Graduate School of Business and Public Administration Library in McGraw Hall has such things as annual reports of every company listed on the major stock exchanges, financial manuals, like *Moody's* and *Dunn & Bradstreet*, plus hundreds of magazines like *Fortune* (and the *Fortune Index*) and *Business Week*. The *Business Periodicals Index* aids in finding material in back issues. The library maintains a file of miscellaneous information about many corporations as well as a similar Industries File and Geographic File. There are many directories and even directories of directories in the form of the *Guide To American Business Directories* and the *Guide To American Directories For Compiling Mailing Lists*.

Space doesn't permit more than suggesting what is available in just these two libraries much less hinting at the material in the Main Library, I & L R and Mann Libraries. It is not necessary to go further, however, because in this and other aspects of job hunting the initiative must be taken by the student.

Westinghouse Astronautics Institute now probing basic problems of interplanetary travel

It was a wise man who first said, "A problem well defined is half solved."

Space exploration is no exception to this rule. Many of the complex activities at Cape Canaveral and our other missile test sites are devoted to better defining the problems involved in space flight.

Westinghouse, for its part, has established an Astronautics Institute to investigate such matters as space craft stabilization, orbital injection, space guidance and communications, the equipment needs of a manned lunar colony, etc. This Westinghouse group has already made significant contributions toward a better understanding of space problems. It has also developed a number of solutions.

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Faculty Profile . . .

PROFESSOR JERROLD MEINWALD

Organic chemistry, traditionally relegated by many engineering students to a position of secondary importance, has been revitalized this year due to the efforts of Professor Jerrold Meinwald of the Chemistry Department. In the seven years that he has been at Cornell, Prof. Meinwald has achieved a considerable degree of success in the field of chemistry.

Born in New York City in 1927, Prof. Meinwald graduated from Stuyvesant High School in 1943. He spent his first term of college at Brooklyn College and, after completing two additional terms at Queens College, he was inducted into the United States' Navy. For somewhat less than two years Prof. Meinwald served as an Electronics Technician 3/c and, in 1946, he entered the University of Chicago to continue his formal education. At Chicago, he was granted the rare degree of Bachelor of Philosophy. His subsequent degrees include the B.S. (Chicago–1948), the M.A. (Harvard–1950), and the Ph. D. (Harvard–1952). In 1952, Prof. Meinwald came to Cornell on a Du Pont post-doctoral fellowship, and he now holds the position of Associate Professor.

In striving to present a refreshing and intellectually stimulating organic chemistry course, Prof. Meinwald employs numerous analogies, and at times he even personifies the electrons which are intimately involved in chemical reactions. For example, in explaining the meaning of a resonance hybrid, Prof. Meinwald used the illustration of a horse and a donkey. The result of cross-breeding is a mule, a distinct entity unlike either of its parents. Such a picture helps to describe a resonance hybrid.

Commenting on the importance of organic chemistry in the engineering curriculum, Prof. Meinwald said that he teaches the fundamentals of organic chemistry with no special effort to slant the subject toward engineers. He hopes that the fundamentals are the tools that the engineer can use when the time comes to apply elementary principles to problems. Very often, mechanical engineers, in particular, want to know why the chemistry of fuels, which often has later applications for them, is not stressed to a larger degree than it is now. Prof. Meinwald answered this by pointing out that the chemistry of fuels is very complex and that the time spent on fully developing one specialized topic such as this would necessitate omitting entire areas of essential basic principles. Furthermore, the field of fuel analysis is constantly being revised so that what would be taught one year would be somewhat obsolete the next. Again, he emphasized that in his view the object of the course was to equip engineers with a vocabulary in organic chemistry.

Lou Jacobson

Professor Jerrold Meinwald, Chemistry

Prof. Meinwald enumerated some of the reasons why he became interested in chemistry (his interest in fireworks and dyes goes back to the age of ten). He finds an intrinsic beauty in organic chemistry. Although the number of compounds and reactions treated is immense, there is an overall logical structure to the subject. Organic chemistry, he feels, would be a satisfying study for any person with normal scientific curiosity.

The extensive research done by Prof. Meinwald bears out his intense curiosity in his field. Over thirty papers concerning his work have been published. One of his first independent research results was obtained in 1953 when he determined the chemical structure of the active constituent of catnip. This achievement received recognition in the classical organic chemistry text by Fieser and Fieser. Several of his papers are unusual in that they involved no experimental work. Prof. Meinwald correlated the results of various experiments and was able to derive new conclusions. Other facets of his work have included research with steroid hormones, the structure of other natural products, and the mechanisms of rearranged reactions. The latter subject involved tracer work with C^{14}, carried out at the Brookhaven National Laboratories. In addition to teaching graduate and undergraduate courses, Prof. Mein-

wald directs the research activities of a group of graduate students and post-doctoral fellows. He performs no laboratory work, but spends most of his time at the blackboard or in the library. In addition, he is an industrial consultant for two pharmaceutical firms.

Prof. Meinwald's favorite interest outside of his academic activity, is music. He is an accomplished musician, playing both the flute and the recorder. In the past he played with the Ithaca Baroque Ensemble, a now-defunct group which specialized in the music of Bach and his contemporaries. At the present time he plays with the Ithaca Chamber Orchestra, directed by Karel Husa.

Prof. Meinwald met his wife Yvonne in 1955 while he was teaching and she doing graduate study. Mrs. Meinwald came to Cornell after graduation from Bryn Mawr College in 1952. She shares his interest in organic chemistry, and obtained her Ph.D. from Cornell in 1955. Last summer, Prof. and Mrs. Meinwald took a trip to Hong Kong and Japan. In Japan, Prof. Meinwald lectured before graduate students.

In 1960–61 there will be a sabbatical leave, but right now Prof. Jerry Meinwald is deriving great satisfaction from teaching the fundamentals of organic chemistry to undergraduate engineers.

—David S. Kessler, ME '62

EMPLOYMENT INTERVIEWS

(Continued from Page 24)

and if you are to advance rapidly, there must be continuing new job openings so that those most talented and industrious can move rapidly into better jobs. This kind of advancement is not possible in a company whose earnings are not growing steadily.

While you are asking these questions, your interviewer will be forming or revising his opinion of you. If you formulate your questions well and ask them in a straightforward, businesslike manner, you will be selling yourself by the questions you ask. Similarly, you will have formed an opinion of the interviewer and his company by his answers to your questions and by the questions he has asked you.

Westinghouse develops new skin for space craft... so they won't burn up re-entering earth's atmosphere

At 6,000 mph, air friction is a problem for space craft re-entering earth's atmosphere, because skin temperatures can exceed 2,500°F. Without adequate thermal protection, the incoming space vehicle will burn itself up like a meteor.

Westinghouse has developed a new ablative material for use as the protecting outer skin for space craft. It has already been service-proven in actual re-entry tests involving firings of ballistic missiles equipped with nose cones of this material.

This new Westinghouse development should do much to help advance our nation's space exploration effort.

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Don Walter, B.S.M.S., achieved an outstanding academic record at Cal Tech, Class of '40, while earning seven varsity letters. Today as Vice President in charge of Engineering and Van Nuys Operations, Don utilizes his technical and teamwork background to lead Marquardt's engineering and development manufacturing.

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FIELDS OPEN

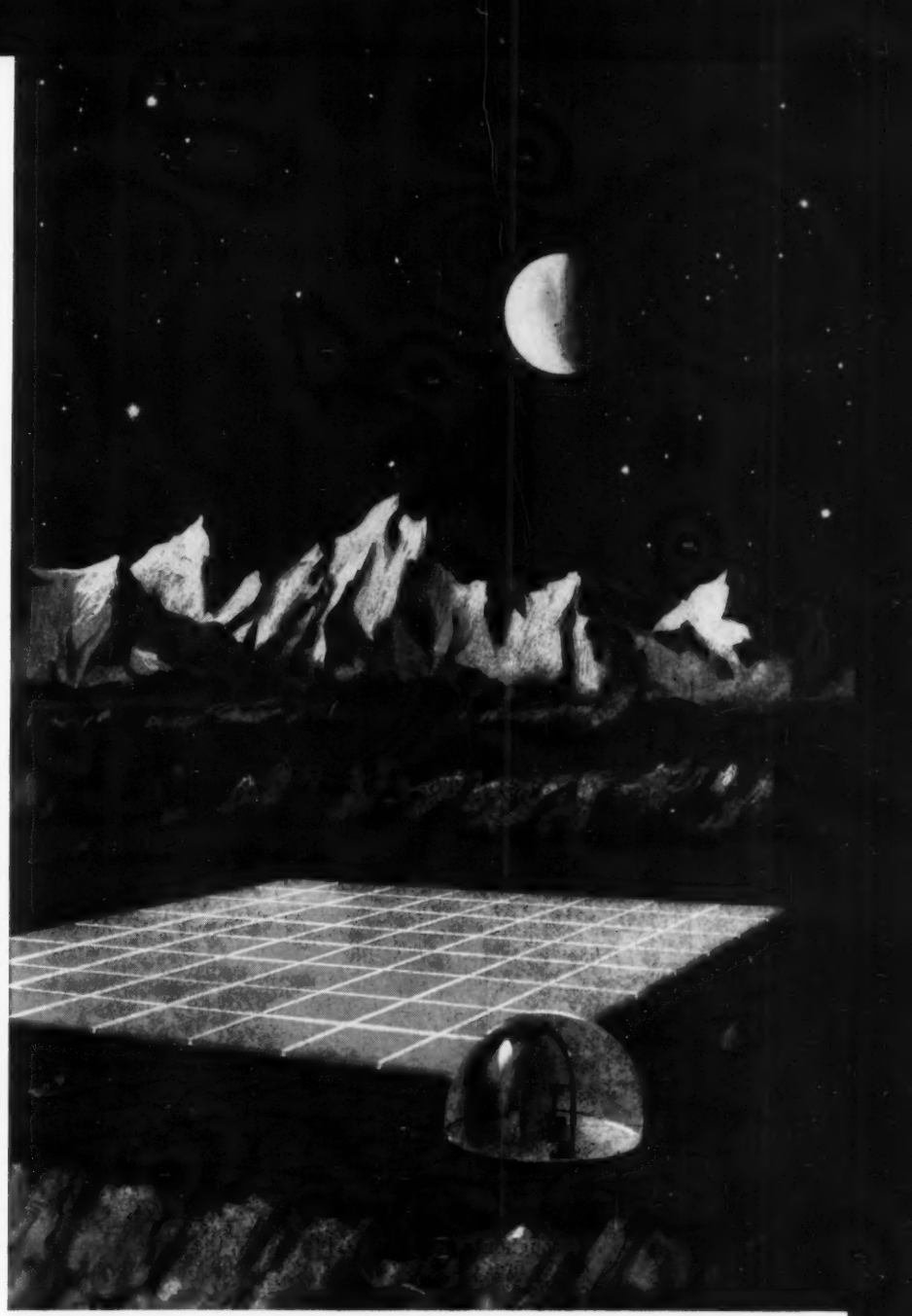
(Continued from Page 21)

portunities to talk to recent graduates should be seized during such trips.

The student interested in technical management and the staff engineering functions associated with operations has perhaps the broadest field of choice and the most difficult selection problem. Some firms provide lengthy training courses which often are found boring and somewhat stifling to the mature or better educated individual who is forced to wait for others in his training group to attain the same level of knowledge. Other firms immediately assign new employees to a specific job. Some firms as a matter of policy select managerial personnel for the production organization from such staffs. Others do not, but rather have separate cadres from which to draw. The selection of the industry and firm involves extensive study and extensive interviewing after which it is necessary to make decisions prior to trips to the few firms that can be observed.

To most Cornellians starting salary is not excessively important. Many have not accepted the largest offer after a careful appraisal of future possibilities. In technical work the starting salary is often a good indicator of the salary structure, however, and in this regard is of importance in appraising long-run promise. The process industries, incidentally, have been taking a larger proportion of graduates in recent years, perhaps because of this factor. In positions leading to management careers, starting salary is less indicative of ultimate pay and less critical in the decisions.

In conclusion, it may be stated that it is impossible to provide a clear list of the advantages and disadvantages of each occupation, industry, and firm. Some answers are framed only in terms of the individual, his likes and dislikes, his desires and abilities, his personality and character. The best single answer may be to select a small, fast-growing, high profit margin firm which has a crying need for a young graduate engineer's services, and which has a corporate name identical with the applicant's.



Westinghouse designs power plant for the moon to provide electricity for man's first space colony

Lunar explorations are no longer the mere dream of a few. Dedicated men all over the world are now actively at work on lunar projects. The first reconnaissance space craft have been launched.

Westinghouse, as part of its effort in the area of space technology, has already designed and demonstrated a practical power plant for use by man's first space colony on the moon. This Westinghouse plant will be very lightweight and compact to facilitate its transport, and it will produce a substantial quantity of electricity from the rays of the sun.

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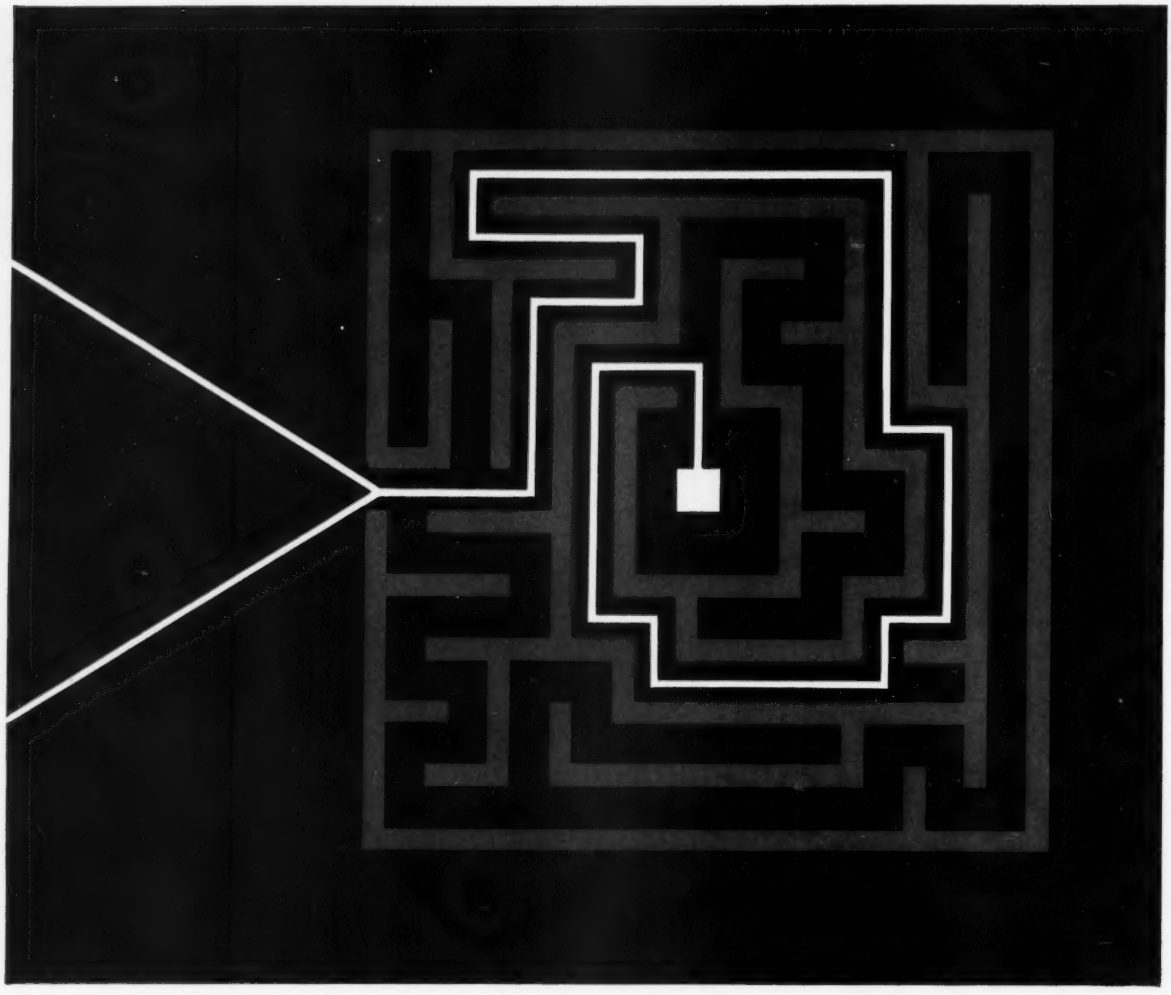

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In addition to the opportunities for work and association with distinguished engineers and scientists, our graduate education tuition refund program encourages engineers to continue their formal training . . . and the facilities for graduate work near ITT locations are superior.

This is an all too brief resume. It would be hard to associate yourself with a company that offers the engineer greater choice of assignment. Write us about your interests — or see our representatives when they visit your campus.

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AIR FORCE

(Continued from Page 28)

$468. * Compare this to the starting pay of the married officer whose monthly pay equals $456, with, however, one-fourth of this sum being tax exempt. Additionally, after only 18 months his pay will increase to $516 and after three years, total $652.

There are some 130 separate and distinctive career specialties in the Air Force. These areas were carefully selected conforming to the most forward management ideas and provide for a maximum recognition of individual skills. Examples of some engineering specialties are: Nuclear Research Officer, Mathematician, Physicist, Chemist, Metallurgist, Computer Program & System Design Officer, and Research & Development Officer.

Other Benefits

Let's look into retirement. While now considerably in the future, this should be considered as an important part of total reimbursement. The military plan is entirely free to Air Force personnel and permits retirement after twenty years of service. After reaching thirty years service, retirement pay equals 75% of base pay. For a colonel, which is the normal rank of this period of service, you would need an annuity of $138,000 to provide this monthly income.

I haven't even mentioned the free medical and dental care, the special military tax exemptions, value of free travel both in the states and overseas including concurrent family travel, uniform allowances, and best of all freedom from draft worries while doing a job respected by the nation at large.

For those advising against a service career, ask them if they can retire at age 43, or about those engineers who are drafted to fill the military needs.

Think about it, if you think you are good enough to make the grade, both mentally and physically, then apply.

---

*Editor's note: Last year the average monthly starting salary for Cornell engineers was $503.

Westinghouse is the best place for talented engineers

The preceding four advertisements have only touched upon Westinghouse activities related to space. Some of the other projects in this area include the investigation of electronic and mechanical phenomena in high vacuums, work with special metals, and the development of various devices for satellite reconnaissance purposes. There are also a number of highly-classified projects.

The wide variety of engineering and scientific work at Westinghouse demands the services of really talented engineers. This *diversity of opportunity* is one of the biggest reasons why so many outstanding engineers have chosen Westinghouse over the years, and the variety of work being done today is greater than it has ever been before. Guided missile controls, atomic power, automation, radar, semi-conductors, and large power equipment are only a few of the other fascinating career fields to be found at Westinghouse.

Why not find out now about the opportunities for you at Westinghouse? Write to Mr. L. H. Noggle, Westinghouse Educational Department, Ardmore and Brinton Roads, Pittsburgh 21, Pa.

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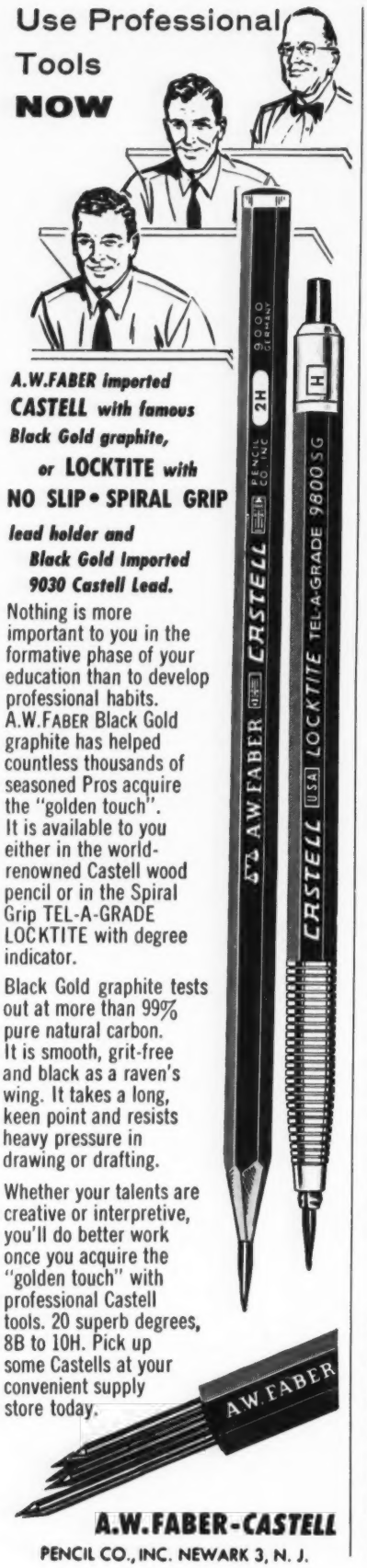
Black Gold graphite tests out at more than 99% pure natural carbon. It is smooth, grit-free and black as a raven's wing. It takes a long, keen point and resists heavy pressure in drawing or drafting.

Whether your talents are creative or interpretive, you'll do better work once you acquire the "golden touch" with professional Castell tools. 20 superb degrees, 8B to 10H. Pick up some Castells at your convenient supply store today.



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ALUMNI NEWS

(Continued from Page 47)

Edward H. Carman III, M.E. '44, an administrative assistant on the management staff of Eastman Kodak Co., Rochester, is one of thirty-five who received fellowships from the Alfred P. Sloan Foundation, Inc. for a year of advanced study, which began in June, at the MIT School of Industrial Management.

Richard Stephenson, Chem.E. '40, is the author of a book entitled "Nuclear Engineering," which was just issued in its second edition by the McGraw-Hill Book Co. Mr. Stephenson was with University of Minnesota department of chemical engineering for four years. He was also senior design engineer at the Oak Ridge National Laboratory from 1950 to 1954. He is now a visiting professor at the Vienna Institute of Technology under a Fulbright grant.

Frank B. Campbell, C.E. '28, was featured speaker at the seventh hydraulic conference of the Iowa Institute of Hydraulic Research at the State University of Iowa, June 16–18. The papers presented at this triennial conference carried the theme of prototype verification of experimental and theoretical prediction in hydraulics and related fields. Mr. Campbell has served as chief of the hydraulic analysis branch of the hydraulics division, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss., for the last seven years. He and his staff are engaged in a most extensive and effective prototype analysis endeavor which was reflected in his paper "The Value of Prototype Tests to Hydraulic Design."

James E. Gleason, M.E. '92, chairman of the board of Gleason Works, Rochester, is one of four men who were honored by the American Society of Mechanical Engineers at its annual meeting, in New York City, December 1–5. He received the Society's highest award, honorary membership. Next February, he will be the guest of honor at the annual dinner of the Cornell Club of Rochester.

COLLEGE NEWS

(Continued from Page 53)

maintain capable people in pure research rather than allowing industry to obtain these people for applied research, and to encourage more people to enter the field of pure research.

Each professor has a specific goal towards which he is working, yet there is no practical value to the research at this time. However, grants of this type are given only when there is evidence that something will be accomplished, usually an advancement in abstract knowledge. The results of this project will be written for publication in the Mathematics Journal.

METHOD OF QUEUE SIMULATION DEVISED BY IE DEPARTMENT

The Department of Industrial and Engineering Administration at Cornell University has recently developed an electro-mechanical device for the simulation of queuing situations. It is to be used for research and instructional purposes.

A queue or waiting line becomes a very complex problem in many industrial situations. Tool cribs, assembly lines and the like are examples. It is hard for management to estimate and to schedule production when it must consider the hard-to-predict queuing situation.

The heart of the device is a series of interlocking relays, activated by punched paper tape inputs simulating customer arrivals and service times. The device has proven to be very effective in stimulating interest in and understanding of queuing problems, as well as a means of demonstration the effects of varying the parameters of the system.

The device is still in a development stage, but ultimately it is planned to have it automatically and randomly select arrival and service times from specified distributions and automatically correlate mean time between arrivals and mean service time with queue length, time of day, and other variables. It will also be able to simulate multi-channel systems; that is, systems with more than one input such as two windows at a ticket office.

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Learn about the exciting work going on now in alloys, carbons, chemicals, gases, plastics, and nuclear energy. Write for "Products and Processes" Booklet A, Union Carbide Corporation, 30 East 42nd St., New York 17, N. Y. In Canada, Union Carbide Canada Limited, Toronto.

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Admission to the KAPL-RPI Program* is limited to recent BS graduates in Engineering, Science or Mathematics. The majority of program openings are in areas of Mechanical, Electrical, Chemical or Metallurgical Engineering and Physics. Preference will be given to applicants with academic standing in upper 10% of class.

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FIRST SEMESTER	Half time at R.P.I. — fees and tuition paid; half time on job, half pay.
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The man didn't say a word when they ran over his cat with a steam roller. He just stood there with a long puss.

° ° °

Chaplain: (To prisoner in electric chair)—Can I do anything for you?

Prisoner—Yes, hold my hand.

° ° °

People are like steamboats—they toot loudest when they are in a fog.

° ° °

Whistler, the famous painter, was exasperated when he came home from work one night and found his mother sitting in the middle of the living room floor.

"What's the matter, Ma?" he demanded. "You off your rocker?"

° ° °

Looking coldly at the man who had just given him a nickel for carrying his bag twelve blocks, the little boy said, "You know, mister, I know something about you."

"What?" said the man.

"You're a bachelor."

"That's right. Do you know anything else about me?"

"So was your father."

° ° °

Say it with flowers, say it with sweets,
Say it with kisses, say it with eats,
Say it with jewelry, say it with drink,
But never, oh never, say it with ink.

° ° °

As one old engineer put it: "The old narrow trails where two cars could barely pass without colliding are happily being replaced by six or eight lane highways where six or more can collide at one time."

° ° °

And then there was the condemned golfer who asked the hangman, "Mind if I take a couple of practice swings?"

A tom cat and a tabby were doing some passionate courting on a back fence at the witching hour of midnight. The tom leaned over and screamed with all the pent-up passion buried within him, "I'd die for you!"

The tabby gazed at him through lowered eyelids and purred her reply, "How many times?"

° ° °

The Professor of English and the Instructor of Engineering were dining together in the Faculty Cafeteria. During the course of the meal the former spoke:

"I had a rather peculiar answer in class today. I asked who wrote the 'Merchant of Venice,' and a rather young freshman replied, 'Please, sir, it wasn't me!'"

"Ha ha ha!" laughed the Engineering Instructor, "and I suppose the little rascal did it all the time."

° ° °

A fond mother asked her four-year-old son what the nursery school had taught the pupils that day.

Replied the youngster: "They taught the boys who hit, not to hit; and the boys who don't hit, to hit back."

° ° °

The dam burst, and the raging flood quickly forced the town people to flee to the hills.

As they gazed down sadly at their flooded homes they saw a straw hat float gently downstream for about fifty feet. Then it stopped, turned around and plowed slowly upstream against the rushing waters. After fifty feet, it turned and moved downstream again. Then upstream again. "Say," said one of the townfolk, "what makes that hat act so darn funny?"

"Well, I ain't sartin sure," spoke up a youth, "but last night I heard Grampa swear—come hell or high water he was agonna mow the lawn today."

Everyday the guards in the Russian work camp checked out the workers as they left the grounds, to prevent stealing. For several days a guard had been watching one particular man pushing out a wheelbarrow full of straw suspiciously but could find nothing hidden in it.

One day, after inspecting the wheelbarrow, he said, "Look Comrade. Tomorrow I am being transferred to Siberia. I'll never see you again and I promise to keep your secret. . . . What in the devil are you stealing?"

The worker looked around cautiously. "Wheelbarrows," he whispered.

° ° °

"Folks," said the minister, "the subject of my sermon dis even' is liars. How many in the congregation has done read the 69th chapter of Saint Matthew?" Nearly every hand in the congregation was raised.

"Dat's right," said the reverend. "You is de folks I want to preach to. Dere ain't no 69th chapter of Matthew."

° ° °

Attention! You can cure your roommate of snoring by good advice, cooperation, kindness and by stuffing an old shirt in his mouth.

° ° °

I walked into the barbershop,
The sign was very queer,
"During alterations
We will shave you in the rear."

° ° °

I come from a small town. They won't allow you to use electric razors there. When you plug 'em in all the trolley cars stop.

° ° °

Wife: "Darling, tell me, how did you ever get Junior to eat olives?"

Ch.E.: "Simple. I started him with Martinis."

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One of a series

General Electric interviews Dr. Richard Folsom, President of Rensselaer Polytechnic Institute, to explore . . .

Teaching— A Career Opportunity For the Engineer

Leading educators, statesmen and industrialists throughout the country are greatly concerned with the current shortage of high-caliber graduates who are seriously considering a career in the field of science or engineering education. Consequently, General Electric has taken this opportunity to explore, with one of America's eminent educators, the opportunities and rewards teaching offers the scientific or engineering student.

Q. Is there in fact a current and continuing need for educators in technical colleges and universities?

A. Colleges and universities providing scientific and engineering educational opportunities are hard pressed at the present moment to obtain the services of a sufficient number of well-qualified teachers to adequately carry out their programs. Projected statistical studies show that this critical need could extend over the next 15 or 20 years.

Q. Why is this need not being met?

A. There are probably three main reasons. These might be classed under conditions of financial return, prestige associated with the position, and lack of knowledge and understanding on the part of the college student of the advantages and rewards teaching as a career can afford.

Q. What steps have been taken to make education a more attractive field to engineering students?

A. Steps are being taken in all areas. For example, we have seen a great deal in the newspapers relating educators' salaries to the importance of the job they are doing. Indications are that these efforts are beginning to bear fruit. Greater professional stature is being achieved as the general public understands that the youth of our nation is the most valuable natural resource that we possess . . . and that those associated with the education of this youth have one of the most important assignments in our country today.

Q. Aside from salary, what rewards can a career in education offer as opposed to careers in government or industry?

A. The principal rewards might be freedom to pursue your own ideas within the general framework of the school, in teaching, research and consulting activities. As colleges and universities are normally organized, a man has three months in the summer time to engage in activities of his own choice. In addition, the educator is in direct contact with students and he has the satisfaction of seeing these students develop under his direction . . . to see them take important positions in local and national affairs.

Q. What preparation should an engineering student undertake for a teaching career?

A. In college, the engineering student should obtain a basic understanding of science, engineering science, humanities and social sciences with some applications in one or more professional engineering areas. He should have frequent career discussions with faculty members and his dean. During graduate work, a desirable activity, the student should have an opportunity to do some teaching.

Q. Must an engineering student obtain advanced degrees before he can teach?

A. It is not absolutely necessary. On the other hand, without advanced degrees, advancement in the academic world would be extremely difficult.

Q. How valuable do you feel industrial experience is to an engineering or scientific educator?

A. Industrial experience for a science educator is desirable; however, with a senior engineering educator, industrial experience is a "must". An ideal engineering educator should have had enough industrial experience so that he understands the problems and responsibilities in carrying a project from its formative stages to successful completion, including not only the technical aspects, but the economic and personal relationships also.

Q. What do you consider to be the optimum method by which an educator can obtain industrial experience?

A. There are many methods. After completion of graduate school, perhaps the most beneficial is a limited but intensive work period in industry. Consulting during an academic year or summer is a helpful activity and is desirable for older members of the staff. Younger educators usually need experience in "living with the job" rather than providing consultant's advice to the responsible individual.

Q. Based on your experience, what personal characteristics are possessed by successful professors?

A. Primarily, successful professors have an excellent and growing knowledge of their subjects, are interested in people, and transmit enthusiasm. They have an ability to explain and impart information with ease. They generate ideas and carry them out because they are devoted to developing their fields of knowledge. They desire personal freedom and action.

For further information on challenging career opportunities in the field of science and engineering education, write to: Mr. W. Leighton Collins, Secretary, American Society for Engineering Education, University of Illinois, Urbana, Ill.

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